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**STUDY HABITS AND LEARNING STYLES AS CORRELATES OF GRADE 11  
STUDENTS' ACADEMIC PERFORMANCE IN MATHEMATICAL LITERACY IN  
THE AMATOLE EDUCATION DISTRICT**

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**201516915**



**A DISSERTATION SUBMITTED IN FULFILMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY**

**FACULTY OF EDUCATION  
UNIVERSITY OF FORT HARE**

**2019**

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**DECLARATION:**

I, **Mzwandile John-Mott Yako**, declare that this study on: **Study Habits and Learning Styles as Correlates of Grade 11 Students' Academic Performance in Mathematical Literacy in the Amatole Education District**, is my original work. The sources have been referenced and that the study has not been submitted for any qualification or degree in any universities or institutions.



**Signature**

**26/01/2019**

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## **ABSTRACT**

This study investigated whether there was correlation in study habits and learning styles with Mathematical Literacy among the Grade 11 (eleven) high school learners. The Amatole Education District was chosen for this study since it is composed of urban and rural schools. Since Mathematical Literacy was introduced in the system of education in South Africa with the understanding that learners who are finding it a challenge to study Mathematics be complemented with Mathematical Literacy to provide them with skills that are a prerequisite for tertiary level and participation in the economic development. The study purposed to establish whether there was a relationship between academic performance with study habits and learning styles in Mathematical Literacy. The study used the post-positivistic paradigm; the approach was quantitative and the design was descriptive correlational. In sampling probability, cluster sampling was used based on the number of high schools in the Amatole Education District of the Eastern Cape. It was then followed by sub-sampling of learners in Grade 11 (eleven) whose mathematical Literacy skills and performance were being investigated in this study. The theory of Covey on study habits and Kolb's theory on learning styles were used as a theoretical framework for the study. The data collection instrument used was a closed-ended questionnaire based on a Likert scale measurement. Confidentiality and anonymity were emphasized with informed consent in place. Data was analyzed using SPSS software and Microsoft Excel. The results showed a significant relationship between note taking, writing skills and Mathematical Literacy skills and performance. The findings on the learning styles indicated no significant relationship between socio-demographic factors (visual language, visual numerical, auditory-numerical e.tc.) and academic performance in Mathematical Literacy. This research revealed that study habits had an impact on the academic performance of learners in mathematical literacy. This relationship between academic performance and study habits is an indication that learners needed to improve in their use of English as a second language, especially on note taking, writing skills and Mathematical Literacy.

**Keywords: Academic achievement; Academic performance, Study habits, Learning Styles, Mathematical Literacy**

## ACKNOWLEDGEMENTS

I thank God Almighty for giving me life, power and wisdom to work on this thesis. I also wish to thank the following for their support and valuable time in helping to be able to compile this thesis.

- My supervisor, Professor Emmanuel O. Adu, for guidance and unwavering support in pursuing and completing this thesis.
- Dr. Anthony Ajayi and Mr. A. Mandeya for helping me in the analysis and interpretation of the data.
- Professor D. Goon for helping in highlighting some inconsistencies.
- Dr. R. Masha for assisting in editing by identifying some grammatical errors and punctuation.
- The students who were willing to participate in the research by responding to the questionnaires to the best of their understanding.
- The educators who allowed their learners to respond to the questions that I needed to know about their study habits and learning styles.
- I thank the data collectors for being enthusiastic in the process of collecting data.
- I thank everybody who had an impact on the study such as my colleagues and friends who encouraged me when I was down.



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## DEDICATION

I wish to dedicate this study to my late parents, Rev. A.C. and Mrs. A.N. Yako who were an inspiration in my life. They encouraged me not give up until I have attained the highest level of education possible in my life.

I further dedicate this study to all the people mentioned below due to the vital roles they played in this study's success. Importantly, my loving wife, Elizabeth Yako, has been a pillar of support to all the initiatives I have embarked on. My two children, Rosemary Nobesuthu Yako and Simphiwe Monwabisi Yako gave me enthusiasm when I started this research though it was late in my professional life. My elder sister, Daphne Nobathembu Yako has been a great support in our family. Lastly, this is dedicated to all my family members who will be proud of me when I put on the cap of wisdom.



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## ACRONYMS

AIDS	: Acquire Immune Deficiency Syndrome
ANA	: Annual National Assessment
ANOVA	: Analysis of Variance (for data analysis)
CD	: Compact Disc
CITE	: Centre for Innovative Teaching Experiences
DDLMS	: Dunn and Dunn Learning Style Model
Do E	: Department of Education
DVD	: Digital Versatile Disc
ESR	: Educator-School Ratio
FET	: Further Education and Training
GDP	: Gross Domestic Product
GPA	: Grade Point Average
GRE	: Graduate Record Examinations
GRLSLSS	: Grasha Reichmann Student Learning Style Scale
GSD	: Gregorc Style Delineator
HIV	: Human Immunodeficiency Virus
ILS	: Index of Learning Style
LER	: Learner-Educator Ration
LSI	: Learning Style Indicator
LSQ	: Learning Style Questionnaire
LSR	: Learner-School Ration



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LSS	: Learner Style Survey
LTM	: Long-term Memory
MBTI	: Myers-Biggs Type Indicator
NSC	: National Senior Certificate
OVC	: Orphaned, Vulnerable Children
PISA	: Program for International Student Assessment
PLSPQ	: Perceptual Learning Styles Preference Questionnaire
PPMC	: Pearson Product Moment Correlations
Rtl	: Response to Intervention
SAS	: Style Analysis Survey
SAT	: Stanford Aptitude Test
SHLSQ	: Study Habits and Learning Styles Questionnaire
SQ4R	: Survey Question, Read, Recite, Relate, Review
SSHA	: Survey Study Habits and Attitudes
STM	: Short-term Memory
TIMSS	: Trends in International Mathematics and Science Studies
TOEFL	: Test of English as a Foreign Language
UNESCO Organization	: United Nations Educational, Scientific and Cultural Organization
USA	: United States of America
VILS	: Vermont Inventory of Learning Style
WM	: Working Memory



<b>Table of Contents</b>	
<b>DECLARATION</b> .....	i
<b>ABSTRACT</b> .....	ii
<b>ACKNOWLEDGEMENTS</b> .....	iii
<b>DEDICATION</b> .....	iv
<b>ACRONYMS</b> .....	v
<b>CHAPTER ONE</b> .....	1
<b>INTRODUCTION AND BACKGROUND</b> .....	1
1.1 Introduction .....	1
1.2 Background to the Study .....	3
1.2.1 Study Habits and Learning Styles in Academic Performance .....	4
1.2.2 Study Habits as an Integral Part of Academic Performance in Mathematics .....	6
1.2.3 Psycho-Social Impact .....	6
1.2.4 Learning Style as it Correlates with Academic Performance in Mathematics .....	7
1.3 Statement of the Problem .....	8
1.4 Research Hypotheses .....	11
1.5 Purpose of the Study .....	11
1.6 Significance of the Study .....	11
1.7 Delimitation of the Study .....	12
1.8 Conceptual and Operational Definitions of Key Terms .....	12
1.8.1 Academic Achievement .....	12
1.8.2 Academic Performance .....	13
1.8.3 Study Habits .....	13
1.8.4 Learning Style .....	14
1.8.5 Mathematical Literacy .....	14
1.9 Summary or Conclusion .....	15
<b>LITERATURE REVIEW AND THEORETICAL FRAMEWORK</b> .....	17
2.1 Introduction .....	17
2.2 The Language in the Learning Process .....	20
2.2.1 Definition of Language .....	21
2.2.2 The Definition of Second Language as it relates to the Learning Process .....	22
2.2.3 Learners and the challenges of the Second Language .....	23





2.2.3.1 Teaching Learners in the Second Language.....	23
2.2.3.2 Fluency in the Second Language.....	24
2.3 Conceptions in Study Habits and Learning Styles.....	26
2.3.1 Conceptions in Study Habits .....	26
2.3.2 Study Habits and Academic Performance .....	26
2.3.3 Effects of Self-Esteem on Study Habits .....	30
2.3.4 Self-Efficacy in Study Habits .....	32
2.3.5 Environment and Social Support as it Relates to Study Habits .....	34
2.3.6 Definition of Learning .....	36
2.3.7 Conceptions in Learning Styles .....	41
2.3.8 Learning Styles and Academic Performance .....	43
2.3.8.1 The Learning Pyramid .....	48
2.3.9 Effects of Learning Styles on Self-Esteem .....	49
2.3.10 Self-Efficacy on Learning Styles .....	50
2.3.11 Environment and Social Support on Learning Styles.....	52
2.3.11.1 Environment.....	53
2.3.11.2 Social Support .....	56
2.4 Correlation of Lesson Content Knowledge and Styles of Learning .....	58
2.4.1 Lesson Content Knowledge.....	59
2.4.2 Lesson Content and the Second Language .....	59
2.4.3 Student/Learner Background.....	60
2.4.4 Personality Traits .....	61
2.4.5 Personality Differences .....	62
2.4.6 Teaching Approach.....	63
2.5 Academic Performance and Study Habits in Mathematics and Other Subjects .....	65
2.6 Mathematical Literacy as Correlated to Study Habits and Learning Styles .....	69
2.6.1 Background to the Introduction of Mathematical Literacy in Education System .....	70
2.6.2 Meaning of Mathematical Literacy.....	71
2.8 Empirical Studies and their Commonalities and Differences.....	83
2.8.1 Study Habits and the International Perspective .....	83
2.8.2 Study Habits and the South African Perspective.....	86
2.8.3 Learning Styles and International Perspective .....	87



2.8.4 Learning Styles and the South African Perspective .....	91
2.9 Theoretical Framework .....	94
2.9.1 Behaviorism .....	95
2.9.3 Kolb’s Theory of Learning Styles .....	97
2.9.4 Covey’s Theory of Habits .....	98
2.10 Summary or Conclusion .....	101
<b>CHAPTER THREE .....</b>	<b>103</b>
<b>RESEARCH METHODOLOGY .....</b>	<b>103</b>
3.1 Introduction .....	103
3.2 Research Paradigm .....	103
3.3 Research Approach .....	107
3.4 Research Design .....	108
3.5 Population, Sample and Sampling Techniques .....	109
3.5.1 Target Population .....	109
3.5.2 Sample .....	110
3.5.4 Criteria for Inclusion and Exclusion .....	112
3.6 Data Collection .....	112
3.6.1 Data Collection Instruments .....	113
3.7 Data Analysis .....	113
3.8 Reliability and Validity .....	114
3.8.1 Reliability .....	114
3.8.2 Validity .....	116
3.9 Ethical Considerations .....	116
3.9.1 Informed Consent .....	117
3.9.2 Confidentiality .....	117
3.10 Anonymity .....	117
3.11 Avoiding Harm to Participants .....	117
3.12 Permission .....	118
3.13 Summary or Conclusion .....	118
<b>CHAPTER FOUR .....</b>	<b>120</b>
<b>DATA PRESENTATION, ANALYSIS AND DISCUSSION OF THE FINDINGS .....</b>	<b>120</b>
4.1 Introduction .....	120
4.2 SAMPLE DESCRIPTION AND ANALYSIS .....	121



University of Fort Hare  
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4.2.1 DEMOGRAPHIC CHARACTERISTICS.....	121
4.2.2 Descriptive statistics .....	124
4.3 Academic Performance in Mid-year Examinations .....	125
4.4 ANALYSIS .....	126
4.5 Research Hypotheses.....	128
4.6 Hypothesis One – Significant relationship between study habits and performance .....	128
4.6.1 Time Management and Performance.....	129
4.6.3 Test Taking/preparation Skills and Performance .....	135
4.6.4 Note Taking and Performance .....	138
4.6.5 Reading Skills and Performance .....	141
4.6.6 Writing Skills and Performance .....	145
4.6.7 Mathematical Skills and Performance.....	148
4.7 Hypothesis Two – Significant relationship between learning styles and performance .....	151
4.7.1 Visual Language and Performance .....	152
4.7.2 Visual Numerical and Performance .....	155
4.7.3 Social-Individual and Performance .....	157
4.7.4 Social-Group and Performance .....	160
4.7.5 Auditory-Language and Performance .....	163
4.7.6 Auditory-Numerical and Performance.....	166
4.7.7 Auditory-Visual-kinaesthetic.....	169
4.7.8 Expressiveness-Oral and Performance .....	171
4.7.9 Expressiveness-Written and Academic Performance .....	173
4. 8 Hypothesis Three .....	176
4.9 Hypothesis Four .....	179
4.10 Hypothesis Five.....	182
4.11 Summary of the results .....	183
4.11.1 Socio-demographic Results in Study Habits.....	183
4.11.2 Socio-demographic Results in Learning Styles .....	184
CHAPTER FIVE.....	185
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS .....	185
5.1 Introduction .....	185
5.2 Discussion of Findings.....	186

<b>5.2.1 Results on the Relationship between Study Habits and Academic Performance .....</b>	<b>187</b>
<b>5.2.2 Results on the Relationship between the Learning Styles and Academic Performance .....</b>	<b>188</b>
<b>5.2.3 Results on the Relationship between Study Habits and Academic Performance .....</b>	<b>189</b>
<b>5.2.4 Results on the Relationship between Learning Styles and Academic Performance .....</b>	<b>190</b>
<b>5.2.5 Results on the Relationship between Geographic Locations of Schools and Academic Performance in Mathematical Literacy of Grade 11 Students. .</b>	<b>190</b>
<b>5.3 Implications on Education, Research and Policy .....</b>	<b>191</b>
<b>5.3.1 Education (Educators and Practitioners).....</b>	<b>191</b>
<b>5.3.2 Research.....</b>	<b>192</b>
<b>5.3.3 Policy .....</b>	<b>193</b>
<b>5.4 Conclusion.....</b>	<b>194</b>
<b>5.5 Limitations of the study.....</b>	<b>195</b>
<b>5.6 Recommendations .....</b>	<b>196</b>
<b>References.....</b>	<b>198</b>
<b>APPENDIX A: INSTRUMENT FOR DATA COLLECTION .....</b>	<b>213</b>
<b>APPENDIX B: Ethical Clearance Certificate .....</b>	<b>220</b>
<b>APPENDIX C .....</b>	<b>222</b>
<b>INFORMED CONSENT.....</b>	<b>222</b>
<b>APPENDIX D: Permission letter from the Department.....</b>	<b>223</b>
<b>APPENDIX E: Ethics Research Confidentiality and Informed Consent Form .....</b>	<b>225</b>
<b>APPENDIX F: PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM FOR USE BY PARENTS/LEGAL GUARDIANS .....</b>	<b>227</b>
<b>APPENDIX G: Language Editing Certificate .....</b>	<b>233</b>





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# CHAPTER ONE

## INTRODUCTION AND BACKGROUND

### 1.1 Introduction

The greatest challenge of an individual is often the process of learning. Learning is always based on acquiring knowledge and understanding the information that is presented. Such a presentation can occur in a formal or informal setting. Learners can be adults or young people with a purpose of understanding and assimilating the information. The different background of learners impacts on the process of learning. Learning can be fulfilling and purposeful in attaining a specific objective resulting in aligning the education system to reach those goals.

The economic, political and social demographic background has influenced ways of thinking, especially in South Africa, within the past few decades because of globalization (Heineck, Walter, Drier & Hollylynne, 1998). The HIV/AIDS pandemic has also impacted on the perceptions of society and the corporate world. It influenced the quality and quantity of production due to absenteeism among employees. This, in turn, creates a concern on the education system, which must produce high school graduates with proficiency, intelligent reasoning, critical thinking and analytic skills that can function well in a global and multi-cultural society.

The absenteeism of educators and learners further creates a vacuum in the classroom, thereby resulting in poor academic performance. There are also different causes of poor academic performance which impact on both educators and learners apart from absenteeism (Sileo, et al., 2008; Lee, et al., 2015; Balkis & Arslam, 2016). Mathematics has been identified as one of the most difficult subjects by most students (Gafoor, 2015; Altintas, 2018).

It is an accepted notion that Mathematics is an essential component for the development of technology. It is a very important subject which promotes critical thinking among learners. Therefore, it needs to be included in the education system (Mogari, et al., 2009). It is imperative for learners to improve their mathematical literacy and academic performance in order to cope with the demands of the global challenges. A high academic performance connotes learners' ability to understand and interpret the information that is

at their disposal with the purpose of applying it. The understanding and assimilation of information requires diligence and dedication (Kolb, 2005; Komaru, 2017).

Study habits and learning styles that are relevant to a good culture of learning and global interaction will assist in the enhancement of better academic performance (Donche, 2007; Covey, 2004; Komaru, 2017). Based on the argument of the shifting of political, economic and demographic trends, the pressure is mounting for better academic performance (Ojose, 2011; McCarthy, 2013). This also leads to acquiring tertiary education, which requires high academic performance for admission in their programs for the economic development, progression and better life amongst humanity.

Students' academic performance is an important factor in determining the students' destiny in life. Students who perform well in high school have better chances of admission in the institutions of higher learning and getting employment (McCarthy, 2013). Poor academic achievement among high school students negatively influences the ability of the student to study further.

The study habits and learning styles of learners play a major role in determining academic performance (Wilson, 2012). Students will perform well academically if their study habits and learning styles are consistent and improved (Rana, 2011). Many factors are attributed to poor academic performance and achievement. Factors that impact on student achievement, as perceived by some researchers on this subject, differ in their approach and conception (Bilge & Tuzgol Dost, 2014). Most authors perceive academic achievement as a dependent variable influenced by extrinsic factors such as environment, socio-economic status, political situation, poverty, lack of equipment in schools, etc. The assertion is that, if extrinsic factors can be altered, academic achievement would improve. Moreover, other extrinsic factors such as social motivation and feedback from others do have an impact on learners (Hemphill, 2011).

The intrinsic factors that impact on learners are self-belief, self-integrity, self-concept, self-regulation, self-verification, etc. (Bandura, 1977). This study focused on study habits and learning styles as correlates of academic achievement in Mathematical Literacy.

## 1.2 Background to the Study

Mathematics is regarded as one of the oldest subjects in the scientific and technological development (Fauvel, 2006). It is also perceived as one of the most difficult subjects to understand, hence the introduction of Mathematical Literacy. Learners who perform well in Mathematics are regarded as the most intelligent persons, and Mathematics is regarded as the key to success in the academic and business world. This perception may have a negative impact on learners who may not have a good foundation in Mathematics and other subjects who would, thus perform poorly. The same learners may also have no study habits or learning styles. Poor academic performance among learners is solely attributed to the difficulty of mathematics, but this perception neglects other factors that may affect student performance in the classroom (Fauvel, 2006). Student performance is the end result of learning and studying, which are to be acquired so that learners can perform better in the learning process. It is in this context that the concept of learning styles and study habits are investigated in the current study to establish whether there is a correlation with Mathematical Literacy and the students' academic performance. The study used both academic performance and academic achievement interchangeably since they are deemed to have the same meaning as relating to learners acquiring information and success in education.

One other concern of the education system is the student dropout at the tertiary level. The expectations and transition from the lower level to higher level do not meet the higher education requirements. The problem may be compounded by the inability of the students to cope with the workload due to lack of self-regulation and self-motivation, which are determined by the study habits and learning styles. Students get overwhelmed by the amount of work and the new environment of the university (Letseka, 2008; Zotti, 2015). Letseka and Maile (2008) assert that out of the 120,000 students enrolled in the year 2000 in the higher education, 36,000 (30%) dropped out in the first year. A further 24,000 (20%) dropped out in the second and third year of their studies. It was also observed that students at Further Education and Training (FET) colleges had a higher drop-out rate of 80%.



## 1.2.1 Study Habits and Learning Styles in Academic Performance

There is a concern in the developed and underdeveloped countries regarding the preparedness of students in participating proficiently in the global competition, especially in technological and economic development (McCarthy, 2013). Some studies in India on study habits indicate that there is a concern regarding students who have passed high school but still exhibit poor academic performance at a higher level (Kumar, 2015). Reading, writing and arithmetic (3R's of basic education) are the key components in the education system which need mastering. Mathematics, being the key issue in technology and development, has caused concern among world leaders and policy makers, hence the introduction of Mathematical Literacy.

Mathematical Literacy had been a 'hot' topic in other countries like Australia and the United States of America (USA). In 2006, South Africa introduced the Mathematical Literacy in its system of education (Vithal, 2006). The introduction of Mathematical Literacy was perceived as a contributing factor in the development of competencies that would enable a learner to reason, solve problems, make decisions and interpret data or information. Unlike Mathematics, Mathematical Literacy is more practical and not abstract (Education, 2011).



The USA also showed some concern in the poor achievement in mathematics. A panel of experts came up with the Response to Intervention (RtI) in order to address the problem of students with low academic achievement. This program was specifically for the Elementary and Middle Schools, that is, Grade 1 to 7, in South African terms. The purpose of this remedial innovation was to assist learners before they fall behind (Gersten, 2009).

Countries such as Kenya and Lesotho seek to address the problem of achievement in relation to academic performance among learners by providing workshops and training seminars for educators. According to Mogari et al. (2009), the specific problem does not only lie with mathematics, educators are also included. A study conducted relating to students' academic achievement by these researchers revealed that most teachers were not well qualified to teach mathematics.

Lesotho showed gender stereotyping of the preconceived notion that mathematics and technology is not supposed to be done by female learners United Nations Educational,

Scientific and Cultural Organization (UNESCO, 2011 - 2012). It was observed in the research process that male students who studied mathematics did not pass well. However, the supposed factors that affected the noted poor performance among male students were not further investigated.

South Africa also faces the same challenge of development and academic performance similar to other countries. As a new democracy with a multicultural society and backdrop from the previous education system, both educators and learners have had to adjust to the new environment (Jansen, 2009). Academic performance depends mostly on the interaction in the classroom because learners spend the most hours of the day at school. Policies have been developed to address the needs of the population in South Africa irrespective of race, creed or gender. The educational and socio-economic problems of the previously disadvantaged groups are all taken into consideration (Borland, 1998).

Allington (2005) cited by Kohn (2006) pointed out that children differ in the process of learning and study. "Therein lies what worries me about 'evidence-based' policy making in education. Good teaching, effective teaching, is not just about using whatever science says 'usually' works best. It is all about finding out what works best for the individual child and the group of children in front of you" (Kohn, 2006). Expectedly, learners go to school with the sole purpose of getting good grades and an education. Parents expect their children to perform well at school. To add, the foremost expectation of teachers and educators is for students to understand their lessons well for better academic performance. For learners to be better equipped to compete in the complex world of scientific advancement, they are to be competent in mathematics and numeracy (Ojose, 2011).

Mathematics and numeracy competencies are important in a global interaction, and this has been a challenge amongst learners and educators (Hemphill, 2011; Ahmar, 2013). Numeracy competency can be defined as the ability to analyze, apply, reason and define data. This involves the subtraction, addition and division of numbers. It is the capacity to describe the role of mathematical concepts and solve a variety of problems. Jobs that have a better future for students require mathematics and numeracy competence, so students who do not have these competencies do not succeed in getting into higher education and in modern knowledge-intensive work. The majority of schools in South

Africa do not get good results in mathematics and numeracy (McCarthy, 2013). This situation does not affect only South Africa as some of the developed countries worldwide are also affected.

There is also a contradiction amongst researchers and opinion-makers. Some claim that competency in teaching mathematics is lacking (McCarthy, 2013; Gersten, 2009) while others have suggested that socio-economic status which focuses on the environment affect academic performance, not to mention private schools which have better facilities and perform better compared to public schools. Study habits and learning patterns of learners are considered as variables that are correlated to the student's academic performance and have an impact on learners (Ahmar, 2013).

### **1.2.2 Study Habits as an Integral Part of Academic Performance in Mathematics**

Learning how to study or develop good study habits is a lifelong process, and one should be ready to modify one's method of study according to time. The development of good study habits is the highway to the goals of an individual, whatever he/she is pursuing (Lawrence, 2014).



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Study habits are the key components of success essential in academic performance among learners. These can be hindered by different aspects of life such as psycho-social impact, socio-economic status and other aspects of life that affect learner performance, as mentioned by scholars (Rana, 2011; Ahmar, 2013).

### **1.2.3 Psycho-Social Impact**

Psycho-social impact can be defined as internal views of an individual emanating from the network of a social structure and personal agency operating through 'phenomenal and functional 'consciousness'. This entails self-regulation, which is study habits, the ability to manage time and ability to be functional. It is how children socialize and develop their individual self. McLeod (2013) asserts that Erikson, unlike Freud, approaches social-impact not on sexuality but on maturation and skills that help in the ability to interact with others, influenced by the impact of the environment as a frame of reference. The environment can have a positive or negative influence on learning styles. A learner may

have high/low self-esteem, which may interfere with the process of learning (Bandura, 1977; McLeod, 2013).

According to Kohn (2011), policy makers and the general public have paid less attention to what happens inside classrooms, and this includes particulars of teaching and learning. An educator can master the content of the subject, but the learner may not be able to comprehend the subject matter. When study habits are identified, instilled and honed, this will help the learner to understand the subject and enjoy the process of learning. A learner who has good study habits is likely to perform well at school and elsewhere because study habits help learners to be able to manage time in creating a schedule and prioritizing important tasks.

Study habits are an important factor in the process of accomplishing better academic performance (Lawrence, 2014). These can be used to define the personality of individual and determinant factors of success in life. Habits are acquired over a long period of time. Covey (2004) asserts that a habit is the intersection of knowledge, skill and desire.

Knowledge is the theoretical paradigm of *what to do* and *why* whilst skill is the *how to do* and desire is the *motivation*, the *want to do* aspect.' These three aspects of study habits are interrelated, and both depend on each other. Creating a habit requires all three dimensions to work together as study habits do not come naturally (Covey, 2004). There must be a desire to acquire certain skills and knowledge.

According to Magno (2010), work method is also a predictor of academic performance and results into study habits. It contains different methods such as techniques, approaches and strategies for effective learning. It also includes planning, monitoring, rehearsal and memorizing (Magno, 2010; Covey, 2004). Hence mathematics, as an abstract subject, needs to be practiced daily to improve study habits of learners (Frith, 2009).

#### **1.2.4 Learning Style as it Correlates with Academic Performance in Mathematics**

Learning style has provided some valuable insights in academic and other settings such as industry and services. Learning has an impact in performance in a job situation and academic performance (Cassidy, 2004). Educators and practitioners are to be aware of

the fact that learners and interns bring in diverse needs into the classroom and workplace. Learner special needs are to be identified so as to be effective in imparting knowledge and avoid mismatch in learning styles, which results in poor academic performance (Wilson, 2012).

A learner whose styles have been identified and proficiently honed progresses in the area of specialty and in most spheres of life. Cassidy (2004) asserts that learning styles correlate significantly with academic performance and other factors such as academic self-efficacy and academic locus of control. Warn (2009) argues that learning style alone cannot be the predictor of academic performance, and this specifically relates to mathematics; since learning style is only a contributor to academic performance, it should be combined with a study strategy to affect better learner performance. Learning style, according to Warn (2009), is only a contributor to academic performance and thus creates a gap that needs to be identified. Understanding study habits and learning styles will help to identify if correlation exists between academic achievement and Mathematical Literacy.

### 1.3 Statement of the Problem



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Many high-level skills shortages are blamed on the education system. There are few matriculates who possess entry requirements for higher education level (Erasmus, 2009). Students do not perform well at high school (McCarthy, 2013) as few meet the entry requirements for tertiary education. Even those who get admission into the institutions of higher learning perform poorly and end up not completing their studies on time (Walker, 2015). This situation is of concern as both human and financial resources are wasted. Poor academic performance is a burden to the South African government as the institutions of higher learning are subsidized by the Department of Higher Learning and Training and students with poor socio-economic background receive scholarships as well. Poor academic performance among students has long-term negative effects as it perpetuates poverty and promotes political instability because of unemployment, which results in riots and service delivery demonstrations. Economic and scientific developments are hindered because of lack of skills amongst the graduates.

The Trends in International Mathematics and Science Studies (TIMSS) report for 2011 shows that South Africa is at the bottom of academic performance in mathematics. Grade

9 was used as a sample in the South African system. This was indicated by the fact that the Grade 9 learners wrote an international standard test for Grade 8 but were below the center point of 500 (McCarthy, 2013).

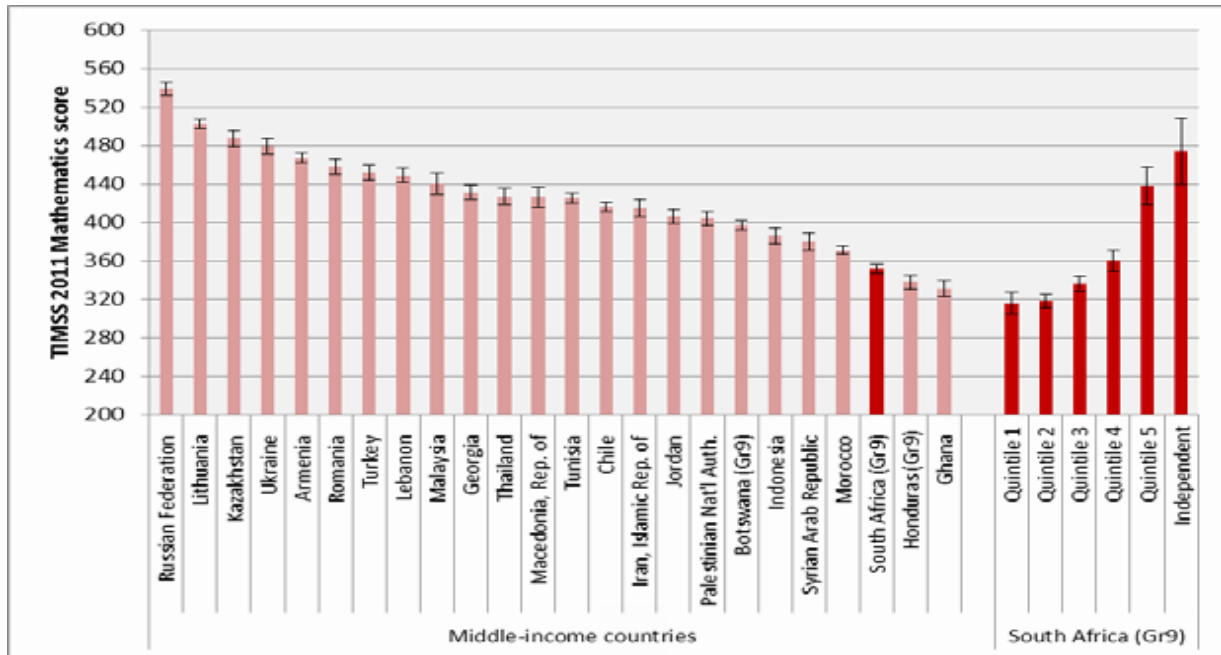


Figure 1.2: The quality of education in South Africa (1994-2011)

Source: Spaull (2013)

The average Grade 8 (South African Grade 9) Mathematics achievement in 2011 in comparison to other middle income countries, illustrates a discrepancy in the system of education in South African. Mathematics is used as an indicator of poor academic performance amongst high school students. Mathematics alone cannot be the only predictor of poor performance. Some of the underlying factors such as learning processes, gender, students' attitude, study habits, teaching process and other variables may have an impact on poor academic performance (Rocha, 2011).

## Performance of Grade 11 in Mathematics – 2012 – 2014

Annual National Assessment (ANA) results are used even in 2018 as a tool to help identify whether learners need some help in the process of learning. In Table 1.1, ANA were used as an indicator for learner performance in Mathematics in the nine provinces of South Africa.

**Table 1.1: ANA Performance on Grade 11 2014 - Department of Education (2015)**

<b>Average Mark (%) on Annual National Assessment</b>			
<b>Province</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
Eastern Cape	14.6	15.8	13.3
Free State	14.0	15.3	12.9
Gauteng Province	14.7	15.9	12.4
KwaZulu-Natal	12.0	14.4	10.7
Limpopo	8.5	9.0	5.9
Mpumalanga	11.9	13.7	11.3
Northern Cape	13.2	12.6	9.7
North West	11.2	13.3	10.6
Western Cape	16.7	17.0	13.0
<b>National</b>	<b>13.0</b>	<b>14.1</b>	<b>11.1</b>

This period of three years was used as an indicator of progression or regression among learners in Mathematics. The national performance of learners in the year 2014 highlights an expectation that learners are supposed to improve, as indicated in the previous years. The drop in performance may have a relationship in study habits and learning styles, thus the hypotheses are based on these variables. Almost all of the provinces show a significant in Mathematics performance.

## 1.4 Research Hypotheses

The study was based on testing the following null hypotheses:

**H<sub>0</sub> 1:** There is no significant relationship between study habits and the academic performance of Grade 11 students in Mathematical Literacy.

**H<sub>0</sub> 2** There is no significant relationship between the learning styles and the academic performance of Grade 11 students in Mathematical Literacy

**H<sub>0</sub> 3** There is no significant relationship between study habits and academic performance and Mathematics Literacy of Grade 11 students.

**H<sub>0</sub> 4** There is no significant relationship between learning styles and academic performance in Mathematical Literacy of Grade 11 students.

**H<sub>0</sub> 5** There is no significant relationship between geographic locations of schools and academic performance in Mathematical Literacy of Grade 11 students.

## 1.5 Purpose of the Study



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The purpose of this study was to examine the correlates of study habits and learning styles in relation to academic achievement in Mathematics Literacy among high school learners.

## 1.6 Significance of the Study

Poor academic performance has a negative impact on the transformation process. The findings of this study will assist educators and policy-makers in addressing academic needs of the students.

Specifically, educators will be able to identify students whose study habits and learning styles need to be enhanced. Educators will also be able to align their approach in conducting lessons according to the needs of the learners. This can be done by using some tests or interviews to help educators to identify the study habits and learning styles of learners. Even though mathematics has been a culprit in causing students to perform



poorly academically, both educators and learners will be better equipped in the learning process.

### **1.7 Delimitation of the Study**

The study is delimited to Grade 11 learners in the Amatole Education District; and the variables of interest are study habits, learning styles and academic achievement and Mathematical Literacy.

### **1.8 Conceptual and Operational Definitions of Key Terms**

The main concepts in the study are defined below for clarification purposes.

#### **1.8.1 Academic Achievement**

Academic achievement refers to a measure of knowledge gained in formal education usually indicated by scores, grade point averages and degrees (Lawrence, 2014). Academic achievement varies with professional requirements in the fields of academia. The requirements differ according to the intensity and importance of the subject like mathematics.



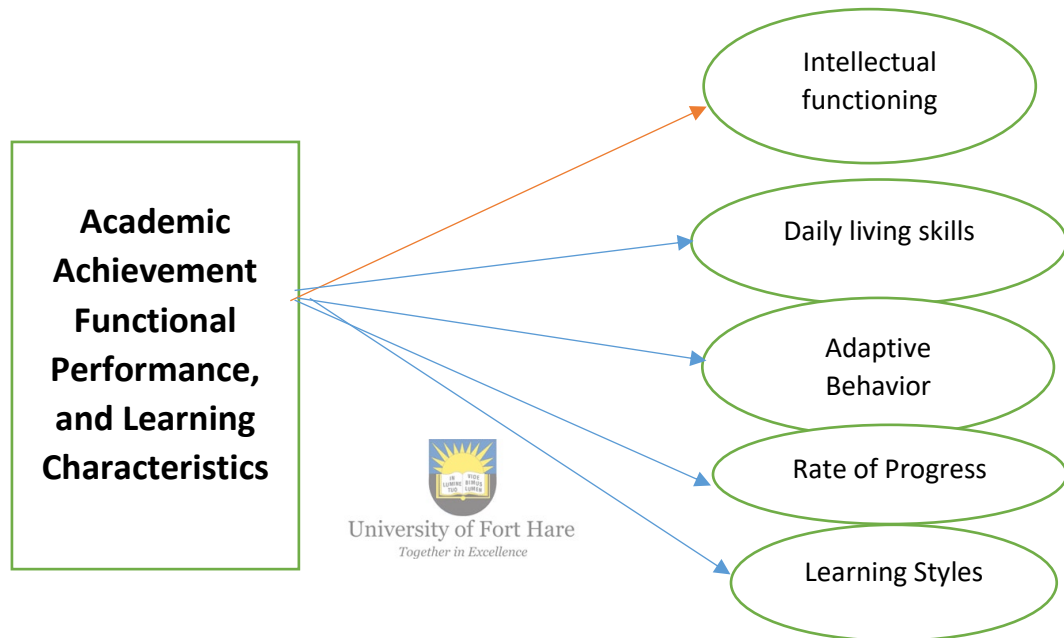
Some systems may use Grade Point Average (GPA), which is the American system. The GPA system is based on A+ = 80 to 100 (Excellent); A = 70 – 80 (Very Good); B = 60 – 70 (Good); C = 50 – 60 (Fair); D = 40 – 50 (Acceptable) and E = 33 – 40 (Just Passed). Below C average is not a good pass although a student can be accepted to higher education (Farooq, 2011; Sternberg, 2003).

Other systems use levels according to the South African system. Academic achievement also indicates the outcome of student in attaining specific task or test in the process of learning (Joshi, 2009).

In this study, academic achievement means knowledge and skills in the subjects that are under observation that include Mathematical Literacy and Mathematics.

## 1.8.2 Academic Performance

Level of performance is a pre-determined level or stage of performance or degree of proficiency, as designated by a school system. It is the ability of the learner or student to apply academic skills in a variety of ways or settings. How the learner performs in a set of examinations is intended to measure or assess the ability of learning and retention of information and its application (Rana, 2011).



**Figure 1.3: Academic Performance Model – Adapted from the New York State Education**

## 1.8.3 Study Habits

*Study habits* refers to the learner's ability to schedule time, plan his study, concentrate, take notes, do mental review over learning and judicious application in a conducive environment (Nadeem, 2014). Study habits in this study are aimed to help determine how the student can effectively allocate time for study, the environment, preparation skills, mathematics skills and writing (Kumar, 2015). Study habits are also regarded as external factors that promote a specific routine for study sessions in a conducive environment (Cerna, 2015).

Lawrence (2014) uses Rao's study habits inventory which defines study habits as the "sum of all the habits, determined purposes and enforced practices that the individual uses in order to learn".

#### 1.8.4 Learning Style

*Learning style* refers to effective means of helping teachers and educators to recognize the incredibly diverse needs students bring into the classroom (Wilson, 2012). In this study, learning style identifies the deep processing of material, self-regulation, how the educator contributes to the learning style of the learner, learning orientation and mental mode.

It is based on the four concepts of Kolb (2005) which are: feeling and sensing; watching; thinking and doing.

**Feeling and sensing** – the learner relies on feeling, based on judgments, peers and authority play an important role, with the instructor as a coach/helper for self-directed autonomous learner.

**Watching** – this a reflective observation based on careful observation in making judgments. This involves listening to the instructor as he/she guides in process of learning. This is more of an auditory approach and mentoring.

**Thinking** – is more of an abstract conceptualization and thinking. The process in thinking is based on facts and theory analysis. Reading and reflective exercises help the learner.

**Doing** – active experimentation is involved. This entails projects, homework and group discussions. The learner is interested in touching everything that is involved in the process of learning (kinesthetic or tactile) (Kolb, 2005).

#### 1.8.5 Mathematical Literacy

South Africa is regarded as one of the developed countries in Africa. It also has higher GDP compared to most African countries, with a few exceptions like Botswana. The student performance in mathematics in South Africa is very low (Sorto, 2010). In order

to circumvent the problem of poor academic performance in mathematics, South Africa introduced Mathematical Literacy (Bowie, 2006; McCarthy, 2013).

The subject *Mathematical Literacy* involves the development of competence in making decisions and the interpreting raw data. It is not abstract compared to Mathematics but exposes the learner to mathematical content as the language of science and technology (Choudhury, 2012; Mbugua, Kibet, & Muthaa, 2012). According to the American system, Mathematical Literacy is referred to as quantitative literacy which emphasizes context in mathematics and application, unlike mathematics, which is abstract (Frith, 2009). It also helps to address the problem of mathematics among high school students, which is regarded as one of the toughest subjects and causes students to perform poorly.

The Turkish government also realized the importance of Mathematical Literacy and introduced in its education system. The government thought that through the Mathematical Literacy, literacy skills for effective functioning in the labor market would be accomplished. Arslan and Yavuz (2012) assert that Mathematical Literacy helps citizens to think mathematically and that the educators need to understand it better. The authors further maintained that not only the learners are to have high self-efficacy in Mathematical Literacy, educators also are to possess that attitude. This is an indication that Mathematical Literacy is regarded as important as mathematics since it is used on a daily basis in business transactions and other alternatives that relate to calculations and measurements.

In this study, Mathematical Literacy is used based on the South African system of education which entails competence in mathematical context or ability to interpret information especially data involving calculation.

## **1.9 Summary or Conclusion**

The study sought to determine whether there is correlation in study habits and learning styles with Mathematical Literacy among the Grade 11 (eleven) high school learners in Amatole Education District.

Mathematical Literacy was introduced in the system of education with the understanding that learners who are finding it a challenge to study Mathematics be complemented with

Mathematical Literacy so as to provide them with skills that are a prerequisite for tertiary level and participation in the economic development. Mathematical Literacy provides learners with proficiency in numeracy, which is related to Mathematics.

Mathematics is one of the subjects that contributes most in technological development worldwide. It is regarded as the oldest subject and provides ability to think abstractly, quantify and analyze information to be used providing estimations. On the other hand, it is regarded as one of the most difficult subjects by learners. Mathematical Literacy provides a substitute for Mathematics for those who find the latter a challenge to study.

In the race to conquer space, Russia was the first country to launch its spaceship to the moon. This caused a stir in developed countries like the United States of America (US) and others. As a result, President J. F. Kennedy resorted to making Mathematics a compulsory subject at schools. The US was the next launch its spacecraft, but academic performance at schools was low. Mathematical Literacy was introduced to address the problem of lower performance, and Australia and others followed suite. In 2006, South Africa also introduced Mathematical Literacy but there is still no improvement in academic performance; instead, it deteriorated and the government ended up using 33% as pass mark.



Based on the theories of Kolb, Vermunt and others, the study sought to determine whether there is a correlation in study habits and learning styles with Mathematical Literacy since its introduction as a variable of intervention.

The next chapter discusses the literature review which provides an overview of the body of research. It provides new ideas about the topic in question and delves into unanswered questions. It also provides a road map for the study by using the theoretical framework as a frame of reference.

## CHAPTER TWO

### LITERATURE REVIEW AND THEORETICAL FRAMEWORK

#### 2.1 Introduction

The second chapter discusses the literature review which covers published works of previous authors on the subject understudied. Literature review is the critical examination of the context, theories, objectives and methods of the works on study habits and learning styles providing a blueprint of the study. Commonalities and disagreements are identified as to how the other researchers discuss the effects of learning styles and study habits in the system of education (Hofstee, 2011). The education system is impacted by many factors within the learning environment. According to Alsubaie (2015), the education system has a 'hidden curriculum'. The impact of the hidden curriculum is based on the expectations, norms and values of the society and the community where the learner comes from and the schools where the students learn. This affects the student positively or negatively in the learning process and renders the learning process complex (Abidin, et al., 2011; Ahmar, 2013). Moreover, educators interact with students who already have perceptions and attitudes relating to their communities and environment, which are implicit and explicit. Academic performance of the learner gets affected by these ideas and expectations, which may be negative or positive, in the process of learning (Busato, 2000).

According to Locke (1693) as a philosophical anthropologist, the young learner or infant is born with an empty tablet that has no information, that is, the mind is still empty like an unwritten book or slate (Mester, 2014). This is the '*tabula rasa*' theory in his 'Thoughts on Education' (1693). According to Locke, information is filled in as the child interacts with the adults who are their role models. It is further explained that, sensory impressions that are received from the external stimuli are stored in the brain or mind for future reference (Schunk, 2012). This information, which the child gets from the adults, and acquired experiences are used as a frame of reference in whatever situation a child finds himself. Hence, it is asserted that the mind is empty at birth and there is no knowledge before

experience (Lacewig, 2014). Therefore, the environment in which the child is brought up determines the ability of the child regarding how to learn and think.

The theory of 'tabula rasa' or empty tablet seems not to take into cognizance or consideration the idea of the impact of genes which is based on heredity by Mendel (Chan, 2002 - 2011; Gray, 2004). Kaelber (2012) added the theory of eugenics which promotes the idea of 'good creation' whose assumption is the process of doing away with bad genes. The proponents of eugenics assert the idea of a new born being born with parents' gene traits (whether the parent is a bad or good individual); this determines whether the offspring will be a thief, an alcoholic, intelligent or follow any inherent trait from the parent (Fisher, 1930). It is within this approach and framework that the eugenics proponents promoted the idea of doing away with the genes that will downgrade the population with unwanted genes inherited from bad parents. It is within this school of thought that the idea of 'good creation' is derived from. Parents with bad genes are to be sterilized so that no offspring from them will be reproduced (Galton, 1904; Fisher, 1930; Kaelber, 2012). Eugenics has been regarded as unscientific by most researchers.



Locke (1693) suggested that the teacher is to take heed of individual temperaments of each child in-order to be able to be effective in the education of the child. This also ties in with the inventory of learning styles by Kolb (2005) whereby a learner is to be evaluated or categorized into the style of learning the individual falls under. The idea by Locke may be more than 300 years old, but it is somewhat relevant today for the purposes of understanding how a learner processes information provided to produce knowledge. Tests are, therefore, used as a form of measuring the performance in the knowledge achieved during the process of learning leading to *academic performance*.

*Academic performance* is a result of sufficiency in learning which entails cognitive and non-cognitive skills. Cognitive skills are based on intellectual approach which involves learning styles whereby learners are involved in abstract thinking and conceptualization. Non-cognitive skills are based on non-intellectual aspects which are personality, motivational and psycho-social factors (Magdalena, 2015; Kolb, 2005). These aspects impact on the learning process, which also affects the academic performance and the ability of students to pass well.

Good academic performance among learners is a result of effective learning. For learning to be effective, it is to be based on learners having a clear understanding of all the subjects they are learning. One of the subjects that learners are to deal with is Mathematics. Mathematics is regarded as the oldest and most difficult subject to learn although it is a key to development, and it requires good performance. It is unanimously accepted as the language of science and technology (Choudhury, 2012; Mbugua, et al., 2012). In this regard, special emphasis has to be made for better academic achievement in mathematics. It is also a well-accepted notion that most students, together with educators, regard mathematics as a complex subject (Choudhury, 2012; Grouws, 2000). Bloom (1971) asserts that:

The complexity of the skills required by the workforce of any highly developed nation like the United States, however, suggests we can no longer assume that completion of secondary and advanced education is for the few. Investment in human resources through education has a greater return rate than capital investment .... We cannot return to an economy in which educational opportunities are scarce, but rather must provide enough opportunities that the largest possible proportion of students will acquire the skills and knowledge necessary to sustain the society's growth.



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The above perceptions and statements made it imperative for the South African system of education to address the problem of competence in numeracy or mathematics as it relates to academic achievement and literacy. It is within this context that the South African system of education adopted Mathematical Literacy as one of the subjects in its curriculum following other countries like the United States of America, Australia and some African states to address the problem of academic performance and achievement as it is associated with poor performance in Mathematics (Education, 2011; Bowie, 2006).

In countries like the United States of America, ways and means of monitoring academic achievement are used. Additionally, remedial courses are in place for individuals who find it hard to make the required grades for higher education. Community colleges which cater for students or persons who do not have entry requirements for university level are available. South Africa has also introduced Furthering Education Training Colleges (FET) in the place of community colleges. The purpose of FET colleges is also the same as the American community colleges.



A means of screening suitable students for higher education using a pre-testing system is also in place in the American system of education. Students at the high school level are required to sit for the Stanford Aptitude Test (SAT) to be admitted into university (Shaw, et al., 2016; Gewertz, 2012). Students who are to enter postgraduate courses are to sit for Graduate Record Exams (GRE). Students whose first language is not English sit for Test of English as a Foreign Language (TOEFL). All of these tests are guardian angels of academic achievement. The use of these test in the system of education is an attempt to accommodate the rest of the learners who may get left out. On the other hand, they safeguard lowering the rating of academic performance in the education process.

It is necessary to first investigate and identify how the learners are able to study and learn effectively. This is to be done by evaluating the study habits and learning styles of the students or learners and see if there is a correlation between academic achievement and the subjects they are studying. It would be a futile exercise to introduce a new subject or add a different subject with the hope of addressing the problem of poor academic achievement. The learning process is based on communication using an official language of the specific country where the learning is taking place. Communication is a two-way approach whereby the communicator uses language that is known and understood by the listener and also a response is expected from the listener to indicate that he/she understands what is communicated. In communication, one expresses his/her thoughts, ideas and culture (Amberg, 2010). The language must be expressed fully, if proper communication is expected and the ideas be understood through the message that is conveyed in the form of spoken or written words. This communication in language can be sign language, spoken or written. This is very essential in the process of learning for better results in academic performance.

## **2.2 The Language in the Learning Process**

The process of learning revolves around the use of language. It is almost imperative for the learners to understand the language of the medium of instruction which is based on the official language of the country. The impact of globalization has compelled the underdeveloped countries like Africa and others to include in their system of education, a

second or third language apart from the native or indigenous language. This imposes a challenge to the learners who are required to study in a language that is not their (mother tongue) first language. Africa is not alone in the incorporation of English in its system of education, Hong Kong, China, India, South Korea and the other former British colonial countries. Young (2018:28) asserts that the English '*language in most business and professional contexts, English remains prominent in both the public and private sectors as the professional medium of written communication.*'

### 2.2.1 Definition of Language

Language needs to be defined so as to get a better perspective and understanding as to how it relates to the present study. The study is based on investigating the relationship of study habits and learning styles as correlates of academic performance. The language is used as a medium of instruction in the process of learning. It is impossible to separate language from learning, which is why it would be suggested that there is no learning without communication and there is no communication without a language. The language is defined as a means of communication in most instances. This definition limits what the language is all about, because it is more than just the means of communication.



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Amberg and Vause (2010:5) define it as follows:-

Language is a rule-based system of signs. Saying that language is rule-based usually makes people think of other kinds of situations where rules are enforced by a particular authority. For example, think about classroom behavior. Students are expected to sit still, be quiet, pay attention, and so on; typically, there are consequences if they don't follow these rules. Language rules, however, are not enforced by any authority figure; language police do not exist. Instead, language rules are conventions. This means that they come into existence through common practice by users of the language rather than through the imposition of an authority figure. We talk about language as a system of rules or conventions because a single language convention, for example, a single word, a pause, or an alphabet letter, does not tell us much beyond its immediate meaning. Thus, we usually combine these conventions together to convey larger meanings.

The above definition is inclusive of most aspects of the uses of language as it is used for writing, conversations, poetry and different occasions. The major use of language in an institution of learning is to connect with the learners and make them understand what they are being taught. In a classroom situation, the educator is to be in cognizance of the fact

that some learners may have their first language (mother tongue) different from that which is used as a medium of instruction. This may pose a challenge to the educator and the learners too. Also some educators may have similar background with that of the learners. The only advantage with the educator would be that of having a better training in the institutions of higher learning during their training and have a good command of English which is the language that is under discussion in the study.

### **2.2.2 The Definition of Second Language as it relates to the Learning Process**

The simplest definition of the second language would be the use of another language for communication purposes apart from the mother tongue. The mother tongue is also referred to as the first language. The infant learns to speak using the language in which he/she was born. A child may be born in a country that uses a specific language for that community but the child belonging to a different nationality. The example is that of a Chinese boy being born in Lesotho, Africa, adopting the culture and language of the community but cannot speak the language of his own nationality. Another example is that of the Afrikaans speaking people of South Africa. They speak Afrikaans and have their own customs and culture and had adopted Afrikaans as an official language but cannot speak the Dutch their native language. Afrikaans to them is their first language.

Mwalongo (2016:28) defines the second language as follows:-

Then in a country where English Language plays an official role, English language can be used in media, government issues, to the court or laws and to the education system, for that nature English language become the second language, as a complementary of the first language or mother tongue (Crystal, 2003). For the education system, English language learners are learners in provincially funded English language schools whose first language is a language other than English ([www.uio.no/studier/emner/hf/ikos/EXFACO](http://www.uio.no/studier/emner/hf/ikos/EXFACO)). In education therefore, language is the vehicle by which knowledge is jointly constructed, internalize and exchange verbal or symbolic utterances for communication (Mercer, 1994).

The South African government had declared the eleven different languages spoken by the most people as official. Though these eleven languages were declared official, only two languages are used for medium of instruction in the education system which is English and Afrikaans. Learners have to learn a minimum of two languages as a requirement for their final matriculation examinations or what is known as senior

certificate to qualify for a job and also admission at tertiary level. Learners whose first language is not English or Afrikaans are therefore compelled to learn of the two languages because they are used as medium of instruction. There are fifty-five countries that have adopted English as a medium of instruction because of its popularity in business and sciences.

### **2.2.3 Learners and the challenges of the Second Language**

The learners together with the teacher have challenges of communication. The main purpose of the teacher is to impart knowledge to the learner. At the same time there is the expectation that the syllabus must be finished on time. If the educator does not finish the syllabus on the expected time is regarded as incompetent. The learners in most instances take a long period to understand the material that is being presented. Within the same class, there are learners who are quick to understand the material and there the slow learners. In the process of learning using second language, the learner is faced with the new material he/she does not understand. There is also the language which is spoken at home only used at school (Jansen, 2009; Mwalongo, 2016; Hossain, 2016).



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#### **2.2.3.1 Teaching Learners in the Second Language**

The use of the second language as a medium of instruction among learners whose language is not English poses some challenges which the educator is to be aware of. It is also difficult to identify which language the learner uses in the thought process as the lesson is taught or a question is asked by a teacher. Hossain suggests the following points to be considered by an educator when in a classroom interacting with learners.

- 1 Know your learners- their language background, their language proficiency, their experiential background.
- 2 Identify the learning outcomes including the language demands of the teaching and learning.
- 3 Maintain the same learning outcome for all the learners.
- 4 Begin with context embedded tasks which make the abstract concrete.
- 5 Provide multiple opportunities for authentic language use with a focus on students using academic language.

6 Ensure a balance between receptive and productive language.

7 Include opportunities for monitoring and self-evaluation.

The ideas and suggestion that have been pronounced provide a strategy that can be followed in the classroom where learning and teaching is taking place. This may also take place at home where the parents or guardians are to be encouraged to provide a conducive environment for studies. In rural areas, learners struggle to have a conducive environment for learning because they have to do some chores. Girls are required to prepare supper for the family and the boys to round up cattle. They also get tired after traveling a long distance to and from school and by the time they are supposed to read and do their homework they are so drowsy and dose off to sleep. The learners who live in the urban areas get distracted by viewing television and computer games. This needs discipline and focusing on the part the learner knowing when to study and how to study. This brings in the concept of study habits which involves the learner in management of time, planning and self-regulation (Ghulam, 2013; Bilge & Tuzgol Dost, 2014; Govender, 2018).

### 2.2.3.2 Fluency in the Second Language



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Fluency in the second language or **any language** can be define as being able to read, write and speak the language. There is the difference between the knowing and the knowledge of the language. One can know how to speak, read and write but having no knowledge of the language. Amberg and Vause (2015:9) assert that there is the difference between (i) **knowing the language** and (ii) the **knowledge of the language**.

#### (i) **Knowing the language**

Knowing a language means knowing its word structures and meanings. Native speakers of English know the meanings of many words and know how to combine these words together. They also know how to coin new words in English.

#### (ii) **Knowledge of the language**

The ability to use the language includes knowledge of the ways in which words are formed.

Native speakers also know how to construct sentences. And the intuitively know when a sentence sounds “wrong.” Note that constructing sentences goes

beyond just putting strings of words together. Sentences must conform to certain rules of language, including rules about meanings.

Fluency in the second language (English) and competence is necessary as it is used as a medium of instruction. It can be any language that is used in that specific country, but for the purposes of clarity in this study, English represents the second language as it is used as the official language and as a medium of instruction in South Africa. Learners who are taught in a second language are to be fluent in it. They must follow all the rules that are used in the language in the construction of a sentence, that is, punctuation, pronunciation when reading, meaning of words and the rest that is needed in grammar and spelling.

Learning becomes complex because the learner must first of know the language that is being used before understanding the material that is being taught. This means that the learner has to create time for study purpose. Study habits become an important factor in this process learning. The learner together with the educator must also be able to identify the learning styles of the student. This makes learning an enjoyable and fruitful process.



The study habits and learning styles will be discussed further as concepts that need to be understood and that they affect the academic performance of the students since they considered as part of the learning process. The study habits involve the following factors like time management, study environment, preparation and test taking skills, note taking and reading skills. The learner must have the fluency in the second language to be able to study or they will read without understanding spending long fruitless hours in the classroom, library or at home. Learning styles entail the visual language in which a learner is more comfortable in reading listening. Others may enjoy working with figures; prefer to learn and study alone; prefer to study with others; hands-on; and more comfortable in speaking about the subject that has been taught. On the other hand there are those who prefer to written expression. All of these factors revolve around the fluency and competence in the second language in the process of learning.

## **2.3 Conceptions in Study Habits and Learning Styles**

Conceptions in study habits and learning styles provide an understanding of the variables that are being studied or researched on. This gives a broader perspective and spectrum as to how other researchers have come to some conclusions after the analysis of the concept. They also provide a theoretical framework or blueprint which a study is to be based on and also lend a scientific approach to the study. The concepts can be improved because they are dynamic and not static in nature because knowledge keeps evolving as new ideas are discovered.

### **2.3.1 Conceptions in Study Habits**

Study habits as a concept of learning become fundamental in instilling a learning process among learners. They also create the desire to acquire knowledge which leads to better academic performance (Covey, 2004). Learners, as individuals, have social aspects that influence their own way of productive learning and thinking which exist in the environment they find themselves in. The environment can have a negative or positive effect on their academic success. Lawrence (2014) states that learning involves study habits and is a gratifying process that needs to be nurtured, so one has to learn how to study. The gratification comes from being able to understand what one is studying, thus resulting in being self-confident and having high self-esteem due to the acquired knowledge. Study habits is an efficient way for a student to learn by managing time in such a way s/he is able to have an effective approach on acquiring knowledge. It is said that some students fail not because they are not intelligent but because they cannot manage their time to acquire information to increase their knowledge. One can get information from books, friends, teachers and elsewhere and by doing research (Rana, 2011).

### **2.3.2 Study Habits and Academic Performance**

Cerna (2015) defines study habits as the ability for student to use time efficiently. This is according to the definition by Crede (2008) cited by Cerna (2015) in which he continues to assert that study habits involve organizing subjects according to their importance and difficulty. The learner engages in self-evaluation, reviews and rehearses the material. Students who get involved in this type of exercise understand the material and this results

in better academic performance. They come to school prepared for the lessons and are usually punctual on any given task or school attendance. It is also asserted that study habits are influenced by external factors such as a conducive environment. For effective study process, there must be a routine that is followed which includes scheduled times of study. This factors in time management with a specific routine to be followed. Self-evaluation is also included as a means of rating the value of time spent on a specific subject (Cerna, 2015).

For a successful process of learning, students are able to identify their abilities to cope with the workload. The workload can involve the subjects that students are embarking on, assignments and or lessons with new information that they are exposed to. On the other hand, the educator must be familiar with the content of the subject s/he is presenting to the learner. At times, learners are blamed for being unable to understand what is being taught whereas at times, the educator is the one at fault. It is, therefore, compelling that the educator must have thorough knowledge and understanding of the subject so that students can have confidence in the educator (Uju, 2017; Ghulam, 2013).

Learners and students are to acquire good study habits and be ready for examinations at any given time. Studying for the purpose of getting a pass or good grade is not regarded as good study habits because it is for a short period for a specific test or examination although it is a necessary reward for hard work (Aquino, 2011; Siahi, 2015; Covey, 2004).

Siahi and Maiyo (2015) also assert that study habits differ from person to person. For better academic achievement, learners are to practice the following suggestions:

- a. Attend classes regularly;
- b. Take down notes during teaching;
- c. Concentrate on studying, that is, practice a habit of reading every day;
- d. Study with the aim of getting the meaning of a lesson and not cramming or rote learning;
- e. Prepare and follow a time table;
- f. Have proper resting periods or take some break to refresh the mind;
- g. Have a specific plan for home and school environment;



- h. Keep daily survey of work done. This will help the learner not to repeat what he/she has done previously and for easy recollection during tests or examinations.

Siahi and Maiyo (2015) call this *Preparation for Success* which is basically saying:

- a. Read the introduction of the textbook before the course begins;
- b. Read the syllabus of the course before the course begins as this gives an idea of what the subject or course is all about;
- c. Read sections in the textbook before the lecture on those topics;
- d. Read the homework assignment the day it is distributed to get an idea of what it is and how long it will take to complete it and start early;
- e. Re-read and understand the sections in the textbook after a lecture;
- f. Create problems related to the work done and solve them;
- g. Talk to other students about the material in the class;
- h. Talk to instructors in class or in their offices; and
- i. Do some corrections in your work after finishing writing, that is, re-check your work



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Studying for an upcoming test means that the student is without a specific timetable or program and an indication that the learner or student is not constantly reading after class. This shows that the learner does not review what was taught in the classroom. The tendency is to just do the homework and thereafter play with friends or watch television. There is no set time for studying and preparing for the following day or reviewing what the learner missed in the classroom so that the following day he/she can approach the teacher for an explanation. It is only when it is announced that there is an upcoming test that the learner will read. Although some researchers disagree with the idea that homework helps the learner to perform well academically, it does help learners in self-discipline and time management (Kohn, 2006). It is also notable among university students that there is a tendency of asking for a scope for upcoming examinations, which is not a bad thing. However, it is an indication that the students do not practice time management and only study to pass instead of knowledge.

For study habits to be effective and fruitful, students need to plan ahead of time. They must have a specific place where it is conducive to study and must be well organized. The student has to learn how to sift from a bulk of information to get the best and relevant information. At present, students and scholars are bombarded with a lot of information from different sources like teachers, books and internet. Some information is not reliable and the student has to sift through this. Students who are successful in their academic achievement are those who are consistent and have good study habits (Siahi, 2015). Bajwa et al. (2011) assert that there are effective studying techniques or study habits which are attributed to Chastain and Thurbor (1989) and Martin (1985). Chastain et al. came up with the acronym *SQ4R* for following actions:

S = Survey; Q = Question;

4R's = Read, Recite, Relate and Review

The SQ4R cannot take place if one does not have a plan, place and time management. This happens when one has read the material and information and also digests what has been taught in the classroom. The following methods of studying are also included in the process:



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- a. Observation;
- b. Learning by doing;
- c. Reading and reviewing;
- d. Discussing with others;
- e. Experimenting;
- f. Thinking around the new ideas and concepts;
- g. Reflecting on what the subject means;
- h. Thinking about practical application;
- i. Listening and asking questions; and
- j. Reformulating - that is, putting something into one's own words (Martin, 1985)

The above methods of studying are inclusive of study habits and learning styles. Study habits cannot take place without learning styles and are very important for academic achievement. Literature review on study habits in South Africa shows very few studies are conducted among high school students. There is enough evidence that high school

learners in South Africa do not perform well at the end of their high school years. It is in this context that Mathematical Literacy was introduced because of poor performance in Mathematics, which affected the aggregate percent.

### **2.3.3 Effects of Self-Esteem on Study Habits**

Baumeister (1993) asserts that low self-esteem individuals are neutral and characterized by uncertainty, instability and inconsistency. Their self-beliefs are external, subject to approval by people they interact with. On the other hand, high self-esteem persons have self-beliefs that are more internal and are more consistent than those of people with low self-esteem (Baumeister, 1993; Bilge, Tuzgol Dost & Bayram, 2014; Joshi, 2009). High and low self-esteem persons do not differ much in motivation to affirm themselves as they both want to maintain a sense of self-integrity. In the process of self-integrity, people with high self-esteem focus on the positive aspect of self-image (Temitope, 2015) whereas people with low self-esteem focus on the negative aspect to boost their morale. Students who perform well in examinations tend to take their success as a validation of their knowledge while poor performers criticize the examinations as not indicative of their abilities (Kohn, 1994).



Self-esteem has many definitions, which are somehow contradictory in nature. Baumeister (1993) brings in the concept of motivation conflict and the self, which is the double-mind of low self-esteem. He asserts that people want to feel good about themselves and want to believe that they are competent, worthy and loved by others. This is a result of self-enhancement, which is a drive to a positive self-image. Alongside self-enhancement stands a drive toward self-consistency. Self-consistency is a desire to protect the self-concept against change. Self-enhancement and self-consistency are found in people who think well of themselves, that is, people with a high self-esteem. Self-enhancement and self-consistency clash in a person with low self-esteem (Howard, 2004; Brady, 1992; Joshi, 2009).

Self-esteem is something that learners and or students deal with throughout the rest of their life time. Human behavior, attitudes and motivation are regarded as the driving influence in self-esteem. To be competent and capable, which result in self-worth, are the

guiding concepts of self-esteem. This means that one is able to start up a task and successfully complete it and earns a sense of being capability and value to whatever the task is related. This sense of value provides motivation of being a success and that of reliability. There is somehow a thin line between self-efficacy and self-esteem since they both deal with the self (Bandura, 1994; Friedel, Cortina & Turner, 2010). Self-esteem is reflected in the personality of an individual as to how he/she relates to other people and the capability to successfully complete any task. This means that in life, one's success or failure is based on self-esteem. If self-esteem is low, one is bound to fail or shy away from getting involved in a task or argument because the pre-conceived idea about self as a failure is more dominant than success. On the other hand, when an individual is faced with a task and completes it, it is because of the understanding that he/she has a capability of doing it. This is a set of attitudes and beliefs that prevail when a person is faced with a task or decision of taking an action to completion. It can be referred to as a frame of reference. Self-esteem can be nurtured for positive reaction or destroyed by a mentor or role model.



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An example of destroying and nurturing self-esteem is presented in the form of a story form of what happened to a learner in a classroom of young learners. The learner was regarded as not intelligent by other learners. To put it in their own language, he was dumb and so the teacher confirmed that. The learner was regarded as dumb because the answers he was giving were contrary to the norms and stereotype of the classroom. The learner was asked a question about sharing oranges between two learners. Question: You have six oranges, how many oranges would you give to the other two learners including yourself? Answer: I don't know. The class laughed at him because to them the answer was too easy for the supposed to divide the oranges "equally" to the learners and give each learner two oranges but to him, the qualifying word equally was missing.

Someone who developed an interest in the learner asked the same question in the absence of the other learners. She was amazed at the reasoning of the dumb learner who mentioned that he was not sure whether to divide the oranges equally or not. It is important for the educator to be precise and observant, and not depend on the stereotyping attitude of teaching and learning. Learners are, therefore, misunderstood

and labelled as not intelligent. This results in learners having a low self-esteem and believes that they are not capable of completing their given tasks. The attitude of incapability becomes more prevalent and overwhelms the learner. Since self-esteem is related to self-evaluation, emotions, desires and goals, the learner loses the sense of direction. The purpose of getting a good grade or mark in a subject is lost because no study habits are developed. Study habits are developed with a goal of achieving a better mark or grade in a given subject. Branden (1994) asserts that there six pillars of self-esteem which are as follows:

- a. Practice of living consciously;
- b. Practice of self-acceptance;
- c. Practice of self-responsibility;
- d. Practice of self-assertiveness;
- e. Practice of living purposely; and
- f. Practice of personal integrity.

The above six pillars self-esteem provide a better understanding of the impact of self-esteem in the study habits and learning of students. Living consciously is a way of self-evaluation being conscious of the expectations of life. Self-acceptance is accepting who you are and not imitating someone else, including knowing your short comings and improving them. Self-responsibility is based on being purposeful, which means that an individual must have plans and time management. Assertiveness relates to creativity and having self-confidence. Personal integrity refers to self-reliance and not doing what your peers think is correct way of doing things. In conclusion, according to Branden, self-esteem is based on daily activities that one chooses to do in conjunction with personal choices that are rewarding and make one feel confident about life.

#### **2.3.4 Self-Efficacy in Study Habits**

Self-efficacy is defined as how an individual perceives him/herself as having the capability to complete any given task with success. The concept of self-efficacy includes low and high self-efficacy, and this is how people feel about themselves. There are also different factors that affect self-efficacy based on four processes, namely, cognitive, motivational, selection and affective, and they affect human functioning (Bandura, 1977). The

proponents of self-efficacy surfaced in the 1970s and was classified under *cognitive theory*. Cognitive theory is based on the assumption that a person acquires knowledge and understanding through thought, imitation or mentoring and experience. There are different effects based on four processes which include cognitive, already mentioned, motivational, affective and selection that affect human functioning in the process of learning and gathering knowledge (Schunk, 2012; Bilge, Tuzgol Dost & Bayram, 2014).

Knowledge is very important in the workplace, society and education. The most important thing is to know how and where to get the knowledge and how to apply it. Learners perform well academically because of the knowledge they have from the material they have learned. Business people are able to amass wealth through the knowledge they have. All of these are not achieved overnight, but one has to be disciplined and consistent in collecting the information. Motivation and knowing how and where to get and apply the information requires consistency and good planning. This is achieved through study habits, and self-efficacy is boosted because of the knowledge and ability to do the task at hand (Schunk, 2012; Kaya, 2016). Effective study habits do not only involve memorization, they also need one to know how to get the information, where to get the information and how to use it. The learner must be able to know the important information to use and must also be aware of the fact that this is a lifetime habit. Learners who practice this become more knowledgeable and achieve academically (Covey, 2004; Schunk, 2012; Kaya, 2016).

The concept of self-regulation or self-regulated learning becomes part of study habits since it has to do with learning. It is defined as goal-oriented learning which means a student has a systematically planned course of study. The student is to have a self-motivated desire to achieve the specific goal. Goals can be deadlines for assignments to be submitted or attaining higher grades or marks for a specific subject or course. It also includes the desire to know, skills to be achieved and knowledge to be attained (Schunk, 2012). Self-efficacy, as a result of regular successes in academic achievement through consistent and regulated planned learning, is realized. It comes after the student realizes that he can perform some tasks that used to be difficult to surmount with the help of information that has been gathered during study time. Self-regulation, therefore,

enhances the ability to achieve goals that have been set. Capabilities are the outcome of persistence and continued learning. These study habits are to be maintained the rest of the life of a student (Bandura, 1994; Aquino, 2011; Kaya, 2016).

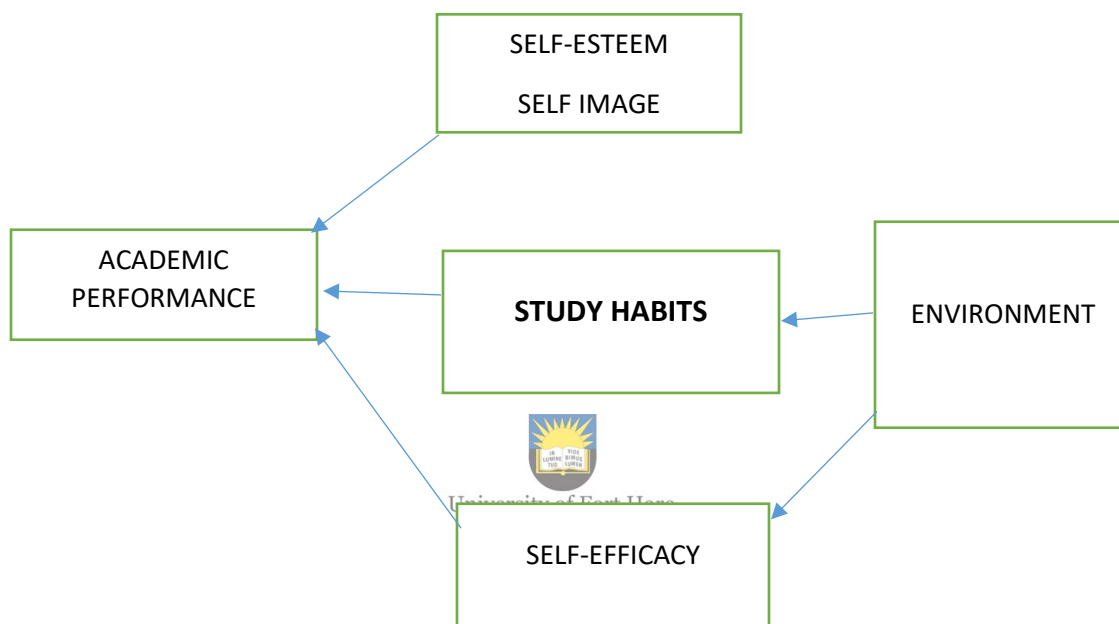
### **2.3.5 Environment and Social Support as it Relates to Study Habits**

The environment determines the culture of the community because of the way the people in that area live. Children who grow up in a specific community tend to embrace the culture under which they live because the expectations demand that one must live according to the traditions and customs of the society. Behavior and attitudes are also determined by the way of life. Social support for students to perform well academically also depends on the environment and community. It is the same society that bolsters self-esteem and self-value of a learner because of the support he/she is awarded (Daniel, 1997; Ghulam, 2013; Leka (Peza), 2015). Social support is one of the components that contribute immensely to study habits and the learning process. The classroom becomes conducive to learning because almost every learner is interested in studying. Underlying the social support is the culture of communities that learners are coming from and the area in which the Schools are located. The communities may have their own cultures, but the major culture of the specific country supersedes minor cultures (Jansen, 2009).

Looking at the South African situation, the major culture of the country is based on Western cultural values, especially in the classroom. Minor cultures may also play an important role in the learning process because some values that the cultures embrace demand that children are to be submissive to the parents and not to talk back. This causes the learner to be submissive at school and listen to the teachers and follow orders without questioning. This may sound negative but helps in the problem of truancy. African culture, as cited by Moleah (1994), has a problem of superstition that plays a negative role in the social support. Furthermore, poverty impacts mostly on African students due to HIV and AIDS related deaths and stigma. Schneil (2004) in her research on HIV/AIDS cites young girls of 8 to 15 years of age who leave their homes in the rural areas for the brighter lights of Johannesburg to make a living through prostitution. The researcher discovered that these street kids earned R1500.00 per month and refuses an offer of R1800.00 for a better life away from the streets and prostitution. When these kids go back to the rural

areas, they pretend to be having normal jobs and influence their peers in the villages to leave home in pursuit of a better life. This is an indirect recruitment for prostitution as life improvement through education is frowned upon. Education, therefore, becomes a waste of time when one can earn a better salary which does not need an education (Daniel, 1997).

### **SELF-ESTEEM, SELF-EFFICACY AND ENVIRONMENT ON ACADEMIC ACHIEVEMENT AS THEY RELATE TO STUDY HABITS**



**Figure 2.1: Proposed model for study habits in relation to high school learners**

The above proposed model speaks to a conducive environment which encourages a learner or student to study effectively. The environment may have enough light, warm, cool and no distractions like noise. In a situation like this, a student will develop good study habits, which will induce regular times for study. Self-efficacy is established because of mastering information and being prepared for the next lesson or class. Moreover, social support is needed especially from the immediate family members whom the students can interact with when having problems. Study habits provide the learner with capabilities that are needed in life. This is a lifetime process that has to be nurtured and creates the ability to manage time, plan and an organized life. The proposed model

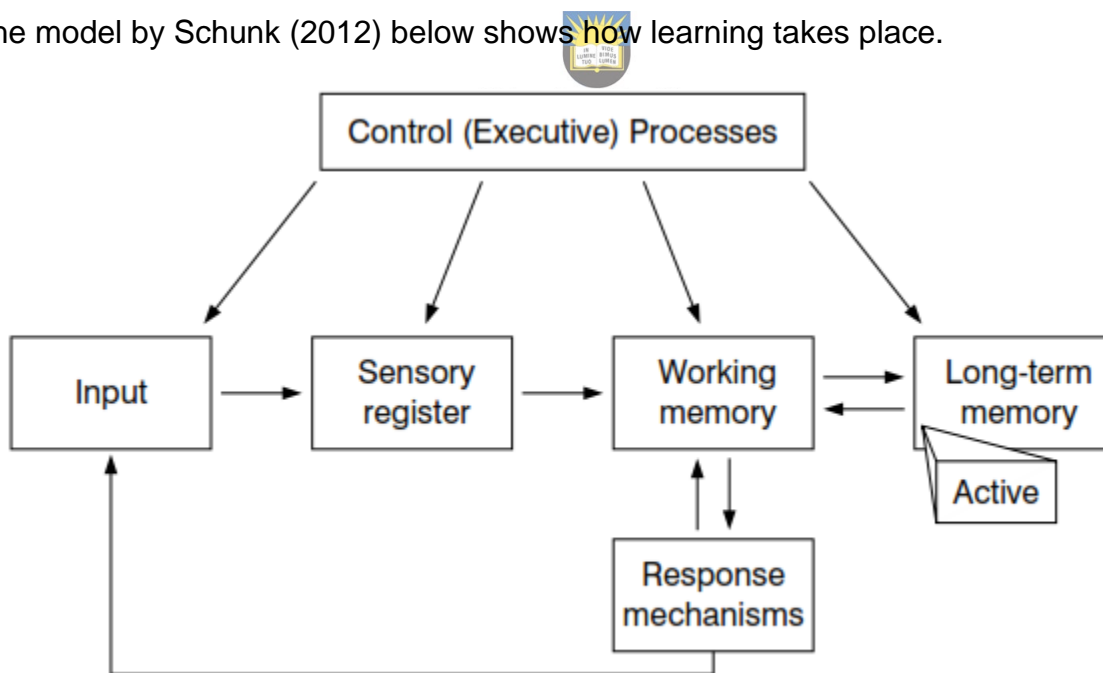


above shows how these aspects relate to each other so as produce better academic performance.

### 2.3.6 Definition of Learning

The learning process involves first, the mind of the learners - which has sensors that are affected by the stimuli. The sensors can be an ear, eye, skin or tongue or whatever sensor is affected by the external stimuli. Data is captured and sent to the brain through the nervous system which has receptors and then the process of interpretation takes place. This is a very fast process but delayed if the sensors are not sensitive enough to identify the stimulus (Schunk, 2012). The process of learning depends on the stimuli and its interpretation. The interpretation is based on the information registered or transmitted to: (a) short-term memory (STM) (b) working memory (WM) and (c) long-term memory (LTM) where the information is kept permanently (Schunk, 2012). Short-term memory works together with working memory to transfer information to the long-term memory where the information is interpreted using stored data.

The model by Schunk (2012) below shows how learning takes place.



**Figure 2.2: The Information Processing Model of Learning and Memory**

The psychologists below define how learning takes place in relation to the model by Schunk (2012).

- a. Learning is a process of progressive behavior adaptation (Skinner 1960);
- b. Learning is a process by which a person becomes changed in his behavior through self-activity (Leagans, 1961);
- c. Learning is the process whereby knowledge is created through the transformation of experience (Kolb, 1984);
- d. Learning as the acquiring or improving the ability to perform a behavioral pattern through experience and practice (Van den Ban; Hawkins 1988; and Weiss, 1990);
- e. Learning is a relatively permanent change in behavior that results from practice (Atkinson et al., (1993); and
- f. According to Woolfolk (1995), learning occurs when experience causes a relatively permanent change in an individual's knowledge or behavior.

The above definitions and perceptions give an ideal situation for learning where there are no underlying factors that affect the learning process. According to these definitions, learning is preceded by learning styles. A student or learner may attend a classroom or lecture and come out having learned nothing. It does not mean that there was no information or an educator. The sensory register or receptors of the stimuli did not respond to the stimulus because of the conditions under which the process took place (Kolb, 2005; Schunk, 2012). Hence, it is necessary to identify the learning styles of a learner to enable a student to learn. There is vast research on both learning styles and study habits as separate concepts that influence academic performance among students. To some extent, learning styles have been popularized to being used out of classroom. This has led to the commercialization of learning styles where individuals have created instruments to be used in the training of employees for new jobs.

It is a well-known notion that human beings differ physically, socially and psychologically, so are their offspring who are bound to be different. Children take after their parents, the environment and experiences and bring these into the classroom (Green, et al., 2006; Schunk, 2012). Their learning styles and study habits are affected by this background

and it is necessary to, therefore, take these aspects into consideration in the definition and conceptualization of learning styles and study habits by researchers.

Conceptions and definitions on study habits and learning styles have been formulated by different researchers. The purpose of this study is to identify the problem of academic performance among learners at a lower level of development and the reason for poor performance in their studies. This problem also affects them at the tertiary level of education (Cassidy, 2004; Farooq, 2011). There are different variables that have been associated with academic performance and used to establish whether they have an effect in the learning process or not. Learning styles and study habits have been identified as some of the variables that affect academic performance by other researchers (Busato, 2000; Coffield, et al., 2004; Donche, 2007; Komaru, 2017).

Learning is a highly complex process in that it involves the learner and the educator whose perspectives of life and background are different. The socio-economic status and motivation of both learner and educator impact on the learning process (Abidin, et al., 2011). The educator has to disseminate information and the learner is to understand, analyze and assimilate the new information. This involves study habits and learning skills which are to be acquired by the learner in stages of development and learning (Nadeem, 2014; Lawrence, 2014; Donche, 2007). Study habits and learning styles involve the environment, time management, observation, conceptualization and thinking (Kolb, 2005). Learning styles and study habits both include the social and the psychological aspects of a learner. The social aspect involves the interaction of the learner during his/her developmental stages of life as a human being. The psychological aspect has to do with the development of the mind which involves the cognitive, self-esteem and the interpretation of the world around the person. This gives rise to personality traits and psychological influences (Busato, 2000; Friedel, et al., 2010; Howard, 2004; Magdalena, 2015).

Taking first the learning styles, Abiding et al. (2011), cite that learning is biologically imposed in that learners have their natural inclinations, and this results in a psychological difference. The experiences that learners go through at the early stages of development and learning differ. A good teacher may find a learner being unable to grasp some simple

concepts which the teacher deems to have been acquired at lower levels or understandable. It could be that a learner is more of a kinesthetic-oriented person, which is based on touching the object and even experimenting or may find out that the learner prefers to interact in class or is abstract-oriented (Kolb, 2005). This means that there should be some kind of inventory about the learning styles of a student. The environment under which they have grown up affects their listening and learning patterns as well.

Kolb (2005) defines learning styles as a habitual approach of a learner in the analysis and transforming of information to be able to understand and apply it in a manner that suits the learner better. The argument is based on the four dimensions of his approach which are as follows:

- a. Concrete experience which is associated with feeling;
- b. Active experimentation, which entails the process of being actively involved in the doing or being kinesthetic;
- c. Reflective observation, that is, being mentored and observing how the specific task at hand is done; and
- d. Abstract conceptualization, which involves thinking and conceptualizing information.



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Learning can also be viewed as a cyclical process in which knowledge and skills are shaped. The process of learning involves strategies used by learners in order to understand and apply the knowledge. This also involves the attitude of the learner at the time of the presentation of the lesson and conditions in which the learner adapts. Table 2.1 presents how conditions in learning are involved. This also gives more clarity in the theory of Kolb learning styles.

**Table 2.1: Learning Styles and Conditions as proposed by Kolb**

<b>Learning Styles and Conditions</b>		
<b>Learning Style</b>	<b>They learn best through</b>	<b>Condition</b>
Diverger	Feeling and Watching	Learn when allowed to observe and gather wide range of information
Assimilator	Thinking and Watching	Learn when presented with sound logical theories to consider
Converger	Thinking and Doing	Learn when presented with practical application of concepts and theories
Accommodator	Feeling and Doing	Learn when allowed to gain hands on applications



Crede and Kuncel (2008) assert that study habits are predictors of academic performance which are non-cognitive as compared to cognitive learning styles. The difference is that study habits entail time management, study environment and reading writing skills. Learning styles are more cognitive in nature, which means conceptualization – a more abstract approach which uses cognitive skills.

Study habits are a prerequisite for success in education, according to Covey (2004). One component of study habits is study skills on a specific subject. The subject may be the one that the learner finds challenging or one she/he understands better. Bilge et al. (2014) also introduce a concept of school engagement which is a three-dimensional approach and affects the process of learning. The dimensions are emotional, behavioral and cognitive aspects. Students with emotional problems have difficulty in concentrating on

their studies. They have no interest in reading or engaging in educational activities. Emotions can be intrinsic or extrinsic (Uju, 2017; Sadeghi, et al., 2012). Learning operates on a multifaceted continuum which involves personality (intrinsic) and environment (extrinsic). An educator is to be aware of these factors and identify the approach to be followed so as to be effective in teaching (Coffield, et al., 2004) (Magdalena, 2015).

### **2.3.7 Conceptions in Learning Styles**

The concept of learning styles is quite a wide subject to grapple with. There are volumes of discussions and interpretations of this concept (Cassidy, 2004). Some researchers have different definitions on learning styles while others regard it as a myth (Reiner, 2010). The proponents of learning styles as a myth assert that learning styles are not different from the abilities, but the basic question is: how can the learners be taught effectively? In other words, educators and learners must understand each other, that is, the way a learner is able to assimilate the information and apply it. There is a lot of information that learners are to go through which is very important for them to understand and apply. The ultimate goal is to achieve high academic performance. Academic performance is correlated to learning styles, and these are differing from person to person because of genetic or biological and psychological differences (Cassidy, 2004).

It can also be argued that learning styles are ways in which persons prefer to receive information. This concept is based on the individual's attitude, beliefs and pre-dispositions about how the information is transmitted. The definition of listening styles by Salisbury and Chen (2007) can be aptly used to define learning styles under the following categories:-

- a. people-oriented listening, that is; focused on the person relating the information;
- b. focusing on emotions and feelings of the speaker;
- c. action-oriented, which prefers concise and error-free information;
- d. content-oriented prefers detailed information; and
- e. time-oriented, which is brief

The definition of Salisbury and Chen (2007) may relate more to adults although young learners also have a short span of attention and thus included. Sadeghi et al. (2012)

examined personality learning styles and define personality learning styles based on the character of an individual which is determined by extrinsic factors that impact on the person's personality. Sadeghi et al. cite Chomsky's theory of no 'blank slate', which is the opposite of Locke's (1693) on 'tabula rasa'.

Pashler et al. (2009) cite that there is a thriving industry on learning styles providing tests and guidebooks for teachers and facilitators. To add, in the corporate world, the concept is rife because employees have to go through training and tests. In the end, information must be assimilated and applied. The most important question that has been posed by some researchers is: how can learners progress in learning if the educators do not know how learners learn? (Coffield, et al., 2004). Educators need to know how to effectively transfer new information to the learners for good academic performance. There are different schools of thought on the concept of learning styles.

Coffield et al. (2004) argue that the learning styles field is not unified and that there are three categories which are: theoretical, pedagogical and commercial.


- a. **Theoretical** – in the theoretical category, there are seventy one (71) models of learning styles and categorized thirteen (13) major models. This is an indication that there is a concern about learning styles. Some models that have been reviewed were not significant because of the smaller samples used as requirements for theses;
- b. **Pedagogical** - this falls in the area of teaching and specialism. Learning styles in sociology, psychology, education fields etc. reflect that particular discipline and defended by proponents of the theory. These end up being fragmented because of the silos they belong to; and
- c. **Commercial** –models that are developed are for commercial purposes. Instruments developed to measure learning styles for learners are commercially based for the purpose of earning a profit. They are purchased by organizations for the purpose of training employees for a specific job for purposes of better production.

### 2.3.8 Learning Styles and Academic Performance

Kolb defines learning styles as a preferred and habitual way of assimilating, defining and applying information; physiological and psychological attributes have an impact on the way the individual learns. Dunn et al. (2010) add the aspect of internalization of data similar to Kolb's assertions. Learning varies from individuals depending on their physical and psychological makeup. Physical makeup may be eyesight, touch, hearing and some other physical aspects of life that create interaction. Psychological aspects may be cognitive, and some learners may have learning disorders which affect their cognitive learning.

It is suggested that some educators teach the way they were taught at either training college or lower levels of education. Accent or pronunciation of certain words may affect a learner's understanding negatively (Uju, 2017; Hemphill, 2011; Perkins & Quaynor, 2011).

Mkhonto (2010) has listed nine instruments of measuring learning as follows:

- 
- a. Kolb Learning Style Indicators (LSI);
  - b. Honey and Mumford Learning Style Questionnaire (LSQ);
  - c. Gregorc Style Delineator (GSD);
  - d. Felder and Silverman Index of Learning Style (ILS);
  - e. Myers-Biggs Type Indicator (MBTI);
  - f. Dunn and Dunn Learning Style Model (DDLMS);
  - g. Vermunt Inventory of Learning Style (VILS);
  - h. Grasha Reichmann Student Learning Style Scales (GRSLSS); and
  - i. Centre for Innovative Teaching Experiences (C.I.T.E.).

This is an indication to appreciate how voluminous research on learning styles has been dealt with since it is a concern of both educators and researchers. The major purpose of these instruments is to measure the effects of learning styles and look at how learners and students learn (Coffield, et al., 2004).



In her unpublished dissertation, Mkhonto (2010) identified seven principles which have an impact in teaching and learning. These are based on theories of Vygotsky (Russian) and Piaget (French), renowned theorists in the psychology. She identified the following principles that impact on the process of learning that influences academic performance of students even in higher learning institutions. These are as follows: active learning, connecting familiar to unfamiliar, process as well as content, guided discovery and scaffolding and group work.

a. **Active learning**

Active learning is where a learner has a self-directed approach and the educator is a facilitator;

b. **Connecting the familiar with the unfamiliar**

This concept is based on moving from the known to the unknown and is extracted from Kolb's theory of learning styles, which is from concrete to the abstract. This applies to young learners who are concrete thinkers and make use of examples using an object that is familiar to the learner.

c. **Process as well as content**

The learner or student uses the process of getting facts and applying the information.



d. **Guided discovery**

Guided discovery assists the learner in connecting previous knowledge to new information. Although similar to the familiar to the unfamiliar concept, it has the notion of 'eureka', which means that the individual discovers something that was not understood previously. This is an individual or personal reflection on the matter in question.

e. **Scaffolding**

It provides information that leads to achieving the object lesson. This is based on the concept of erecting a building using scaffolds as a means of assisting in the process of building. This may not be part of the lesson but leads to understanding of the lesson as scaffolds are not part of the building but help in the achievement of the objective.

f. **Group work**

Working together as a team entails collaboration among learners. The formation of study groups helps the learners to contribute to the lesson study. The educator is the supervisor or facilitator of the process. This helps students who have different learning styles to contribute more effectively. Some learners may be prone to auditory, visual, and kinesthetic or even the numerical approach and may like to be involved in a group discussion. All of these put together will help to reach the objective of the lesson. Group work is more effective on high school or higher education learners than the lower classes (Mkhonto 2010).

The question may be asked: why is academic achievement associated with learning styles? The answer to this would be that learning is a process to achieve academic success, which is the end product of academic performance (Busato, 2000). The learner is faced with the challenge of deciphering the data presented to him/her, so there needs to be a strategy and ways of understanding the information. It is in this situation where learning styles come into play. The educator is to understand and acquaint him/herself with how the learner learns or else the process of educating the student would be futile.



Learning styles is a more complex concept in that it is affected by diverse manners, approaches and attitudes. Intelligence, drive and degree of motivation can be used as one of the predictors of academic performance which is the end product of learning styles or strategy. Most researchers have diverse approaches and definitions on learning styles depend on the data collected, the profile of the population, the tools that were used in data collection and the analysis.

Seiver et al. (2014) assert that students have different approaches of learning styles which affect various ways of studying other subjects or courses. Students are more comfortable in studying some courses because of their personality. These authors use Myer-Briggs Type Indicator (MBTI)'s proposition of learning styles which have personality dimensions. MBTI's categories of learning styles are as follows; (i) Extraversion (ii) Sensing (iii) Thinking (iv) Judging (v) Introversion (vi) Intuition (vii) Feeling and (viii) Perceiving. The definitions of these factors are:

- a. Extraversion - this factor focuses on attention on outer world of people and things. Students learn more effectively when they are engaged in activity.
- b. Sensing – sensing focuses on concrete aspects. These have practical mind or pragmatists and are concerned with details.
- c. Thinking – they seek logic in their analysis of the situation. The focus is on decision making and fairness.
- d. Judging – this type of a learner is organized and orderly. They are good planners and prefer closure on their lives or whatever they pursue it must have an ending.
- e. Introversion – these ones learn through reflection. They must refer back to the framework with thoroughness.
- f. Intuition – they are abstract and focus on the bigger picture. Their emphasis is on change and future. These can be referred to as people with a foresight and creativity.
- g. Feeling - they have desire for harmony and consider or aware of their impact on people. They are also appreciative and sympathetic.
- h. Perceiving - they are easily adaptive to a situation rather than taking control. The decisions are open-ended to make room for change and are flexible.



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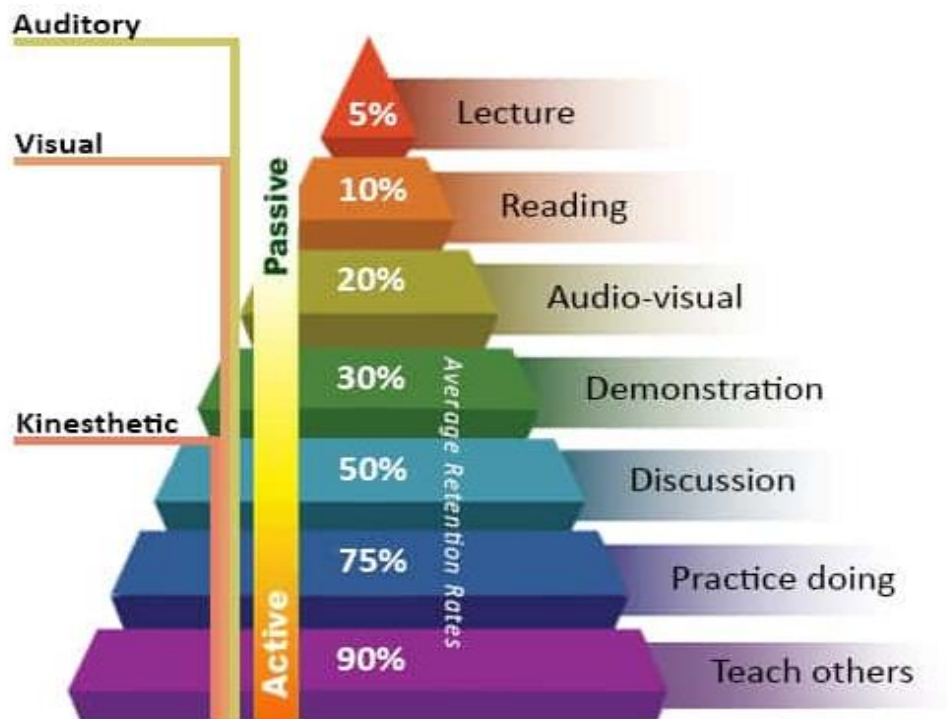
The MBTI approach serves as a guide to help educators to identify the different personalities of learners and their learning strategies. Moreover, subjects or courses that students delve in can determine which category the student falls under. These categories also overlap each other since some may have an impact on both feeling and intuition (Seiver & Haddad, 2014).

The conclusions and findings in the MBTI approach reveal that academic performance and learning styles have an effect on acquiring education. Learning can be in an academic situation or training for the employment purposes. This has led to the commercialization of the process of learning among trainers for specific jobs of employment in the commercial entities and also some organization charge students who have a problem and need help in Mathematics. Coffield et al.(2004), in the introduction of the Learning styles and Pedagogy, pose a pertinent question of, “How can we teach students if we do not know how the learners learn?” This is a probing question subsequent to many

theories that have been advanced to address the learning process and, thus giving rise to many researches in the follow-up of learning styles or strategies.

To put into perspective the concept of learning, the learning pyramid is used. The learning pyramid is an adaptation of Edgar Dale's **Cone of Experience**. The Cone of Experience has eleven (11) stages with the bottom that has concrete experience and is more retentive and practical or hands-on in the process of learning. The peak is more abstract and retention is less established and deals more with reading. These stages are related to Kolb's theory of the Inventory of Learning Styles (Kolb, 2005). Dale asserts that more senses are to be used in the process of learning for it to be more effective. This includes the cognitive skills and motor skills which are also involved in learning which Schunk (2012) also advances. The example of the combination of cognitive and motor skill is when a learner is taught how to write. Children are not born knowing how to write, they have to be taught this skill which is the combination of cognitive and motor skills. First, the teacher must show and give them the pencil and paper tell them the use of these instruments. The teacher must demonstrate on the board describing the simplest form of writing, the "O" vowel. This is to be practiced until the learners are able to do it without look at the board. This may be a simple exercise, but it is the building block of education which will be more complex as the learning advances using different languages, calculations and drawing beautiful pictures. Humans are not born being able to speak and write their languages, it all starts at a simplest form and grows to complication.





Adapted from the NTL Institute of Applied Behavioral Science Learning Pyramid

**Figure 2.3 The Learning Pyramid derived from Cone of Experience in Edgar Dale's work**



### 2.3.8.1 The Learning Pyramid

The Learning Pyramid is able to present the Learning Styles Inventory in a more simple way showing how effective learning occurs though there is disagreement with some researchers. It highlights varying study methods that learners have since learners do not have the same learning styles. Some researchers disagree with the 10% retention of information when reading. They argue that there is not enough research on that area. They overlook the fact that, a learner or student has to rehearse audibly or silently for retention (Schunk, 2012).

The Learning Pyramid suggests that "Lecture" is one of the most ineffective methods for learning and retaining information. Lecture is a passive form of learning where you simply sit back and listens to information being spoon fed to you by your teacher or professor.

Contrary to the notion that learners are to be actively involved according to the 'learning pyramid', though learners are actively involved in Mathematics the majority of them as revealed in their academic performance do not perform well. According to the psychologist and behaviorist researchers, learners are affected by their self-esteem in the process of learning (Bandura, 1977; Baumeister, 1993; Busato, 2000; Daniel, 1997; Schunk, 2012).

### **2.3.9 Effects of Learning Styles on Self-Esteem**

Schunk (2012:3) defines learning as 'an enduring change in behavior, or in the capacity to behave in a given fashion, which results from practice or other forms of experience' (Schunk, 2012). This is evident in the well-known and popular Russian psychologist Pavlov's experiment on a dog that was taught to salivate at the ringing of a bell expecting to be fed.

There are three criteria of learning which are:

- a. Criterion for change which involves changes in perceptions, the way an individual thinks and the behavior. This perspective can create a high self-esteem, which is, being confident and being happy with oneself. It can also be negative with low self-esteem.
- b. Learning endures overtime. This concept means that what students learn in a class will occur for a long period during the duration of the preparation for a specific task or examinations. This means that what one learns even after a long period of time will still be remembered and be usable.
- c. Learning also occurs through the experience. Practice and observation of the others especially when an infant learns how to speak a language. This also occurs when one learns how to drive a motor vehicle which requires observation and practice. Once an individual has properly acquired what is being taught, it creates a sense of satisfaction and confidence.

The result is the realization or satisfaction of achievement in both criteria because of the learning process that has taken place. Sternke (2010) asserts that self-conception and self-esteem are the key precursors that determine the ability of a person in the development during childhood, and that assists the person to be able to cope in life.

Unlike Schunk (2012) who alludes to the genetic influence in the learning of language, he overlooks its influence concentrating on self-concept and self-esteem. Sternke (2010) proposes that these need to be nurtured from childhood (infancy), adolescence and adulthood; nurturing is to be positive. The resultant factor is high self-esteem and competence in any task to be undertaken.

Sternke (2010) defines self-conception as an overall self-knowledge and evaluation. On the other hand, self-esteem is based on feelings of an individual about him/herself. These concepts seem to overlap for they both have to do with self or individual's perception of self. Since learning involves change of attitudes and perceptions it will therefore enable the learner to change either for positive which will enhance better performance or negative, which has the opposite effect. On the other hand, if there is negativity, self-esteem will be lowered resulting into poor academic performance. A highly self-esteemed person is able to identify the best in him/her and identify the best way he/she can learn and strategies to decipher, apply and assimilate the information. In this process, the educator and learner are to be involved. The educator acts as a facilitator to help the learner to identify his/her learning styles.



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### **2.3.10 Self-Efficacy on Learning Styles**

Self-efficacy has a profound impact on learning style. Learners have to be confident in what they are doing so as to be able to succeed and perform well academically. Self-efficacy is the engine that propels the student in the process of learning and the ability for a learner to use some strategies so as to be able to reach the objectives or goals that are set for success. According to the definition of self-efficacy, it is 'the optimistic self-belief in our competence or chances of successfully accomplishing a task, and producing a favorable outcome' (Akhtar, 2008). The author proposes that four major sources of self-efficacy or even more. These are based on experiences which are as follows:

- a. **Mastery Experiences** – this is the experience that comes after an individual has successfully completed a task under odd circumstances. It is like mastering a new language that is foreign to a person or a subject that most people regard it as very difficult;

- b. Vicarious Experiences - having a role model that succeeds in performing a specific task that one thinks that the role model has the same capabilities that you have;
- c. Verbal Persuasion – being encouraged by either teachers/educators, parents, managers, mentors, etc. that one can succeed because one possesses the capabilities to succeed; and
- d. Emotional and Physiological State – it is the positive emotions that boost the morale or confidence in successfully completing a task (Akhtar, 2008).

An individual may have both components occurring at the different timelines, like building blocks that lead to a complete structure. These may not occur at the same time because self-efficacy is somewhat acquired or nurtured as learning is a step by step process. Self-efficacy belief is based on the premises of how people feel, think, behave and motivate themselves into achieving specific goals. This perspective is more prevalent into the process of learning. It also enhances the ability to accomplish tasks which are difficult to some individuals who do not have the self-efficacy. Persons with self-efficacy look at the brighter side of life and use this as means of attaining some tasks that may seem difficult. They do not see problems as impediment but look at them as challenges (Bandura, 1977; Akhtar, 2008; Bilge & Tuzgol Dost, 2014; Bandura, 1994). These type of learners are high achievers. Self-efficacy may have an overlap with self-esteem because both concepts deal with self-perception. Self-efficacy includes the *self-satisfying* and *self-dissatisfying* concept. Self-satisfying is when the goal is achieved and the person is happy with the achievement. This means that the goal of the task is reached and this means accomplishment. On the other hand, when the goal is not achieved, one does not become satisfied with the input and self because the task is looked at as a challenge that can be achieved. The person therefore exerts greater effort to master the challenge with strong perseverance (Bandura, 1994).

The learner therefore has to be able to persevere in the process of learning recognizing his/her learning styles to achieve the goal. Moreover, the educator on the other hand has to identify the learning style of the learner and be in a position to nurture the learner to enhance his/her self-efficacy. Learners have a tendency of easily giving up when they do not understand the subject they are learning and regard themselves as being low achievers. It is because they lack the understanding of their abilities to learn and also the



educator teaches students the way he/she was taught because of the environment they have been nurtured in, learners believe the label they have been given as low achievers and not intelligent enough as compared to their counterparts. It is a different for those whose environment is conducive to study and learn. An environment that is conducive to learning is where there is enough light during the learning periods and study hours with no distractions. It provides for comfortable sitting and enough space for movement, fresh air and need be good sunlight during the day. The family and community where the individual is residing have to be supportive of the activities the student is involved in.

### **2.3.11 Environment and Social Support on Learning Styles**

The majority of the learners who attend school in South Africa belong to the rural communities and also the townships. These are the poor communities who depend on self-subsistence farming, working in the mines and factories especially the males. They earn very low wages and the women whose husbands are deceased do menial jobs just to put food on the table. According to Statistics South Africa their children attend public schools which are poorly equipped and have no resources (Education, 2018). In these poverty stricken communities, diseases are rife especially the endemic HIV/AIDS. HIV/AIDS also infects and affects children who are born from the infected parents. Both parents may die because of the disease and the children will be left with relatives or by themselves hence we have orphaned, vulnerable children (OVC). Due to vulnerability, these children are either abused by the relatives or bullied at school.


These statistics are available at the clinics and medical centers but not used by the educators and administrators or translated to school settings. These children are not identified at school because of the clause of disclosure and doctor's patient confidentiality. On the other hand, the social support for learners is lacking because the parents are either illiterate or deceased. Young girls and boys become heads of the household.

### 2.3.11.1 Environment

The first discussion is on environment which affects the ability of learner in the process of learning. The environment encourages the learner to either have a positive or negative self-perception of him/her. This can be experienced in a classroom situation or home environment.

Larson (2009:156) defines environment as follows:

Environment literally means surrounding and everything that affect an organism during its lifetime is collectively known as its environment. In other words, environment is sum total of water, air and land interrelationships among themselves and also with human being, other living organisms and property.

The environment with the learner also includes the place where the learner is studying. It is how conducive the place where one is studying. The classroom may have bright lights or natural light coming in. Some students may prefer a quiet place whereas others may enjoy studying with background music. Environment cannot be only confined in the classroom. Some factors affect the learner in the community and family. The child's environment is also his family, school and at times church. Sociologists regard these institutions as the fabric of the society.  These play a vital role in the development of a child's ability to cope with the world. These are responsible for the cognitive, social, emotional, physical body, speech and language abilities. The cognitive development is the one that is to be emphasized on because it is responsible for the learning styles and influenced by the environment in which a learner grows. The environment can impact on the learner negatively resulting in low or high self-esteem (Baumeister, 1993; Daniel, 1997; Busato, 2000; Metofe & Walker, 2014).

Taking high self-esteem individuals as it affects the learner in the process of learning. Persons with high self-esteem are often regarded to be better in setting and meeting their goals than low self-esteem. The people who are depressed and with low self-esteem suffer when they are rejected and want to bring others to like them yet they continue acting precisely the way that caused them to be repelled.

Leary, et al. (1995:179) state:

Among high self-esteem individuals, unstable self-esteem appears to reflect more fragile and vulnerable self-feelings and greater reactivity to both positive and negative self-relevant events. In contrast, among low self-esteem individuals, unstable self-esteem appears to reflect more resilient self-feelings, and less adverse reactions to negative self-relevant events.

It is also suggested that depressed people:

- a. engage in self-serving downward comparisons;
- b. solicit highly positive feedback from others; and
- c. make self-serving attributions.

Example, they take special credit for success and deny responsibility for failure in area of their favourable self-evaluation.

Leary et al. (1995) assert that low self-esteem plays an important role in emotional and dysfunctional behavioural problems. The authors list just a few of these following variables, example, anxiety, depression, loneliness, jealousy, shyness, and the general unhappiness. It is also asserted that people with low self-esteem are less assertive, less likely to enjoy friendships, and more likely to drop out of school. Furthermore, they are more inclined to behave in ways that pose a danger to them or to society. Low self-esteem is also associated with unsafe sex, teenage pregnancy, the aggression and criminal behaviour, the abuse of alcohol and other drug related activities. These individuals belong to deviant groups.

The deviant groups feel they are socially rejected. Leary et al (1995) use these following definitions to describe the social rejection:

- a. Sociometer – is first used as a model in the discussion. It is defined as a means of detecting rejection and acceptance of an individual socially;
- b. Dysphonic emotions – is a reaction of many kinds like depression, anxiety, loneliness, etc.; and
- c. Substance abuse, sexual behavior.

The exclusion and rejection of an individual is related to the maladjustment of people. These characteristics cited above are determinant factors of misbehavior among adolescents and a means of self-protection in misbehavior. The perception of the causes of low/high self-esteem is said to be related to extrinsic factors such as, socio-economic status, social fabric, dissonant religious context, broken family, birth order, etc. Socio-economic status refers to the social level, namely, the lower class, middle class, upper class, etc. Social fabric which is not very familiar to most people is associated with family relationship in determining self. Also social integration may be viewed as a feature of society or as a characteristic of the individual. Feeling of attachment to groups, institutions or norms is a type of integration. The attachment is influenced by a person's level of self-esteem.

Divorce and death of one of the parents is regarded as broken family syndrome that leads to low self-esteem especially among the HIV/AIDS orphans. The orphans become victims of molestation by their relatives which leads to guilty feelings or the fear of reprisal if they come out and tell about their situation. This automatically leaves the victim with very low self-esteem and that no one to share the problem with. Divorce has a negative influence on the child's self-esteem because parents end up using the child as an object of unleashing their anger and frustration. In some religions and beliefs, divorce is regarded as a social stigma. The persons involved in divorce are forced to reconcile even if they are not compatible. Some stay in marriage though they know very well that they have problems but because of the stigma they do not opt for divorce. This unhealthy relationship affects the children.

The above mentioned characteristics and assertions lead to dysfunctional learning styles which affect the academic performance of learners. They are unable to function in a classroom situation because they are regarded by their peers as not intelligent enough to learn. Even the educators expect them to fail if they are given a task to perform because of their behavior. Some educator label them as 'problem children'. Hence, it is advisable for the educators to identify them and guide them accordingly.

### 2.3.11.2 Social Support

The social support system as it relates to academic achievement and self-esteem overlaps with socio-economic status, parental support and teacher support. Society and self-values are assigned equal weight. Each quality may not be equally important to an individual. He/she may care a great deal about one and not care about the other quality of life. Values differ according to social learning, social roles and social groups (Davidovitch, 2017). Students who reported participation in voluntary formal organizations or extracurricular activities had high self-esteem. Participants who took part in leadership in club and class showed high self-esteem. Low self-esteem students are less likely to join formal groups like friendship groups, cliques, gangs, crowds, potlucks, etc. The society in which the student lives in has an impact on the student's behavior and academic achievement. This includes the environment of the student. The environment can have a negative and positive influence on the student performance. For example, students living in Black Townships where poverty is prevalent tend to have low self-esteem because they are possessed by the inferiority complex as they interact with others. The society they come from has specific norms and values related to who they are (Brady, 1992; Gebaner & Constantine and Wiebke, 2012).

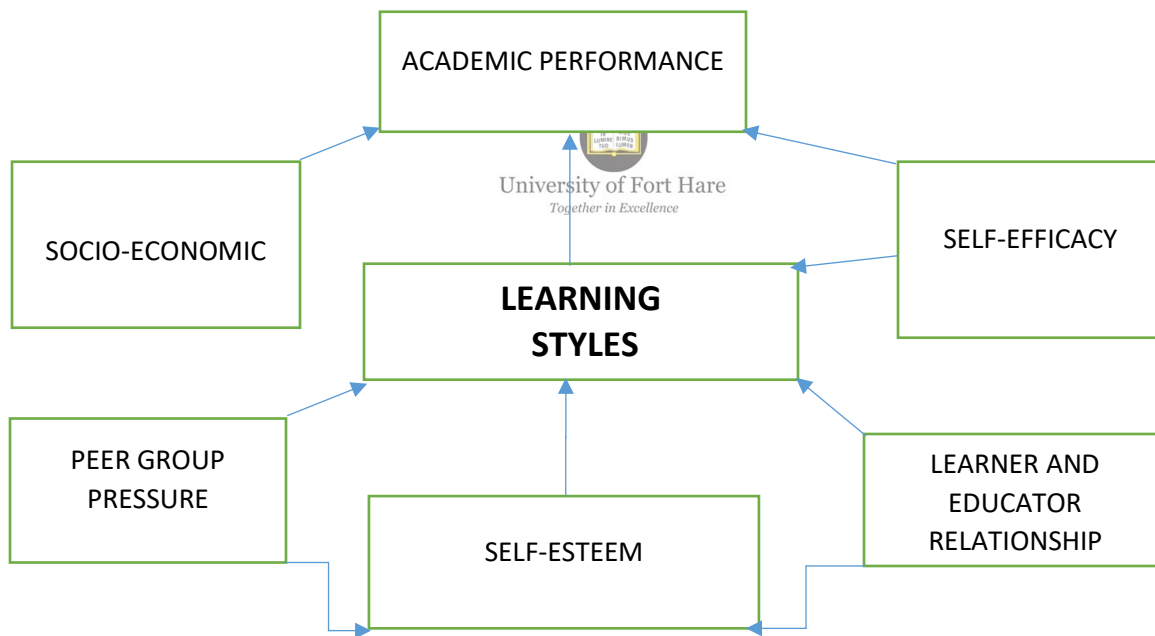


Morse, et al. (1972) assert that social psychologists who study the phenomena of socialization, meaning the process of being made fit or trained for a social environment, are interested in how the individual learns the rules governing his/her behavior toward other persons in his society, the groups of which he is a member, and individuals with whom he/she comes into contact. Attitudes have generally been regarded as learned predispositions that exert some consistent influence on responses toward objects, persons, or groups. Attitudes are usually seen as products of socialization and therefore as modifiable. The behavior of an individual is often consistent with his/her attitudes towards his environment. It is suggested that attitudes of a person about a group of people or the environment can often be changed by inducing the person to change his behavior toward the group or environment. There is also the perception that a person infers unknown characteristics of another from other characteristics that he/she does know. The inferred characteristics can be positive or negative toward certain

perspectives more specifically on educational achievement. These attitudes affect the individual's choice of remaining within the society or environment (Ahmar, 2013; Khumalo, 2013).

Students in the rural areas have beliefs that make them feel unworthy. In the rural areas, there is the problem of 'abathakathi' as cited by Moleah (1993). Students together with their parents, believe in witchcraft, which renders them powerless against those who practice witchcraft. In some instances, prosperity is associated with witchcraft. The proposed model below is purposed to consolidate and define the relationship of perceptions that impact on learning styles which determine the academic performance of learners as discussed above.

**Self-Esteem, Self-Efficacy, Relationship between Learner and Educator and Group Pressure on Academic Achievement as they Relate to Learning Styles**



**Figure 2.4: Proposed model for learning styles in relationship to high school learners**

The self-esteem of a learner plays a major role in the ability to cope with the day to day activities of learning in the classroom and is enhanced by self-efficacy which provides determination and motivation to complete a task. The socio-economic aspect helps the learner identify him/herself in a positive or negative approach. It also relates to the self-esteem self-efficacy. Learners and educators relate to self-efficacy and peer group pressure. If the educator identifies the learning styles of a learner and encourages the learner, the learner's confidence is boosted knowing that the teacher can talk positively about him/her. The peers recognize the ability of the learner and do not have negative attitude towards the learner. The ability to learn gets enhanced and academic performance is improved.

#### **2.4 Correlation of Lesson Content Knowledge and Styles of Learning**

Busato (2000) cites that Schmeck considers learning styles as “deep processing, elaborative processing, fact retention and methodical study”. This assertion correlates more with the learning of mathematics. The studying of mathematics or Mathematical Literacy requires deep processing and methodical study. The same process will also be applicable to the study of subjects like history, biology and the rest though the subjects may differ according to their content and will need a different approach (Bilge & Tuzgol Dost, 2014; Donche, 2007; Hemphill, 2011). Mogari, et al (2009) assert that for learners to be able to perform better academically, teachers are to have a more understanding of the subject matter than the student. It is suggested that to minimize poor academic performance among students, teachers need relevant education and training to adequately prepare them to handle and manage the teaching-learning tasks they are expected to carry out in class (Mogari, et al., 2009; McCarthy, 2013). The relevant education and training helps the educator to identify the areas that need to be addressed. These can be the background of a learner, teaching methods and different approaches that the learners can be interested in learning. Learning and teaching must be enjoyable and fulfilling to both the teacher and the learner hence there are different ways of approaching a lesson.

### **2.4.1 Lesson Content Knowledge**

Lesson content is one of the factors that are important in the process of learning. Content is the translation of the subject matter into a classroom knowledge which is suitable for the objectives of the subject (Modiba, 2015). In the simplest terms, the content of the lesson is what the teacher is going to lecture on or to teach the students. The educator prepares the lesson with an introduction, body and conclusion. The introduction provides the map to be followed in the journey of the lesson, that is, what is expected to be learned. The body is the main objective of the lesson concluding with the summary, question time if possible and lastly, assignment or homework. The example of the objectives of the subject is to teach the learners or students how to plot data in a graph or to make a journal entry in an accounting subject. In this process, the first requirement is for the educator to understand the content of the subject to be able to transfer the knowledge to the students. The teaching instruction process is usually conducted using the medium of instruction. An educator can have a good preparation for the lesson, but fails to transfer the knowledge to the students. Here, there are many factors like shyness to speak the second language, pronunciation and some other factors that may cause the inability of the learners not to understand the lesson (Asif & Bashir, 2018). The process of learning is based on communication in which the language is used as the medium and is usually one of the factors (Perkins & Quaynor, 2011; Hossain, 2016).

### **2.4.2 Lesson Content and the Second Language**

Modiba (2015) asserted that the lesson content is the translation of the subject matter into a classroom knowledge using either the first language or second language of a learner as a medium of instruction. The educator who is teaching learners in the second language has a task of teaching two subjects at the same time. Example, if a teacher is teaching a student a history lesson, he/she has to be mindful of sentence construction and the proper use of words. In the process of marking the script, the teacher has to pay attention to the grammatical errors apart from historical facts that are to be provided by a learner. Here the teacher is doing a double job whereby he/she is taking into consideration the proper use of the language and the lesson content for both History and English.



The study habits for writing, reading and note-taking become essential. In the learning styles the listening, which is classified under auditory language whereby the learner does better in a given task when listening to instructions and in the visual language the learner prefers to read. The study habits and learning styles provides the educator with the better understanding of the background of the learner. The learning process becomes fruitful and enjoyable.

### **2.4.3 Student/Learner Background**

It is necessary to look at both the educator and the learner's background so as to be able to have a meaningful discussion in the lesson content and learning styles. The content of the lesson is what the lesson is all about and as it is taught by the educator who may have a different background compared to that of the learner. The educator must also have an understanding of the subject matter and have a good command of the language of the medium of instruction (Green, et al., 2006; Donche, 2007). Learning involves cognitive processes which include thoughts, beliefs and emotions which are stored in the mind of an individual. The mind or brain of a human being is a very complicated and complex organ. The mind is part of the brain but abstract because it stores conceptions, emotions, perceptions and the rest of the personal ideas that characterize a human being. The brain is the physical part of the body that is situated in the head of human or animal and controls the functions of the body through the messages that are relayed by central nervous system through the process of synapse. The brain is the generator of the messages using neurons to send messages to the different parts of the body. The brain is constantly gathering information from early childhood to the death bed. It is where the learning process takes place (Schunk, 2012).

The brain has the ability to receive any type of information that is accessible to the individual. It is stored in the mind and retrieved now and again for reference purposes. It is this information that a learner uses in the process of learning. It gives the background of every situation that is encountered. The information may have different suggestions because of good or bad experiences. Again, the student may have different background because of the upbringing and the educator too. It becomes a complicated process to

match the different backgrounds (Brady, 1992; Aquino, 2011; Schunk, 2012). Hence, the learning styles and study habits of the students are to be identified.

#### 2.4.4 Personality Traits

The interaction of the educator and learner in the classroom has an impact on the personalities of both the teacher and the student. Whenever there is a person to person activity, the first concern or question that always come out is 'what type of a character or personality does the person have?' It is the type of thing or question that people tend to think about. This happens at work, school or even in social gatherings. It is also helpful to know the personality of the person one is dealing with especially in a situation where there is learning. There are different definitions of personality traits which will be used as they are relevant to the discussion of the study. Personality traits can be: - (a) disposition (b) temperament (c) temper and (d) character.

- a. Disposition implies customary moods and attitude toward the life around one (cheerful disposition)
- b. Temperament implies a pattern of innate characteristics associated with one's specific physical and nervous organization.
- c. Temper implies the qualities acquired through experience that determine how a person or group meets difficulties or handles situations
- d. Characters apply to the aggregate of moral qualities by which a person is judged apart from intelligence, competence or special talents.

In summary, personality includes or may refer to the different characteristic patterns of thinking, feeling and behaving.

Hussian et al (2017) in their study identified the Big Five Personality Traits Model factors that impact on academic achievement. These are openness to experience, conscientiousness, extraversion, agreeableness and neuroticism or intellect. These are essential in understanding of the expected behavior of a learner and also identifying the possible way to circumspect that possibility.

The definition of the five personality traits can be viewed as follows:-

- (a) Openness refers to being intellectually inquisitive and associated with academic achievement.

- (b) Conscientiousness a person is well organized in his studies or work and also work ethics
- (c) Extraversion is an outgoing individual who is capable of socializing with others, that is, social individual.
- (d) Agreeableness is similar to extraversion but is more of the inconsistent side which results in poor academic performance.
- (e) Neuroticism and on the side of being more intellectual. The person is creative and curious (Abu Hussain, 2017).

The personality traits are more associated with the learning styles and study habits because of some of the factors that have been in the big five personality traits. The significance of personality traits assist in the identification of the predicted behavior of learners. An educator must therefore be able to identify some of these since these will enhance better communication amongst the students who are being taught (Abu Hussain, 2017).

#### **2.4.5 Personality Differences**



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Humans are different in their behavior, character and personality. They relate to stimuli in different ways according to their experiences and make-up. The environment under which they had lived and reared has an impact on their physiological and psychological upbringing. The environment is inclusive of the economic status and the community. Psychologists and sociologists classify them according to their different schools of thought. The psychologist will label human behavior as a personality trait which is mostly influenced by the community the individual is coming from. It is not the community only that has an influence on the individual. The inherited genes from the parents have an impact in the behavior of an individual ( Fisher, 1930; Busato, 2000; Coffield, et al., 2004; Gray, 2004; Metofe & Walker, 2014)).

Cloninger (2017) asserts that there are TWO components of personality, namely, (a) temperament and (b) character.

### **(a) Temperament**

Cloninger first defines temperament as an individual differences in perception, habits and skills. It is also a response to emotional stimuli that determine habits and moods.

### **(b) Character**

Character differences in individuals are based on conceptions, goals and values. These are encoded in the special part of the brain related to propositional memory and learning.

Accordingly, temperament and character are related to learning. Character is influenced by the socio-cultural learning (the dictum of molding of character for a specific purpose which experience at an early age till adulthood). It is abstract and self-directed behavior which includes empathy and highly developed in humans. Temperament has to do with habits and character has to do with cognitive sets. They both have multiple components which are related to each other (Cloninger, 2017).



Personality therefore is inclusive of temperament and character according to Cloninger. Cloninger (2017) is a proponent of infusing character and temperament base on his psycho-biological approach which involves neurobiology studies. The above discussion seeks to clarify the relevance of background of the learner as it relates to the lesson content and learning styles which the educator needs to be aware of. In the learning process the educator deals and molds the character of the learner. The learner must understand what the lesson is all about at the same time the learner gets assimilated in the process in that the learner has to reproduce or apply the information. This leads to the teaching method or approach.

### **2.4.6 Teaching Approach**

There are different teaching methods that are used by different institutions of learning but the commonly used one is (a) **the teacher-centered approach** which involves the teacher being the source of knowledge and information. It is based on lecturing to the

students. The second one is **(b) student/learner approach** which allows the learner to freely express him/herself in a guided environment.

#### **(a) Teacher-centered Approach**


This is a commonly used approach by most educators. The teacher-centered approach depends on the combination of different factors such as the student numbers, teaching materials, and personality of the instructor, motivation and attitudes of students. The teacher is the source of information and knowledge that is transmitted. The students are required to pay attention to the educator resulting in a restricted atmosphere. It is on specific periods that the learners are required to interact with the educator but most of the time the educator is the one that is actively involved. When the assignments or homework is given students or learners are to follow specific requirements and format. The learners have a tendency of not expressing themselves and their own ideas (Oskouel, 2012; Al-Zube, 2013).

#### **(b) Student/learner-centered Approach**

The student/learner-centered approach is derived from the philosophy that was espoused by the Italian researcher by the name of Montessori and is termed Montessori Education or Method. This a child-centered type of education. Its fundamental model is based on human development. The model has two basic principles which are: - children and adults to be allowed to interact with the environment in self-constructive. Children have an innate path of psychological development, that is, to be allowed to act freely and spontaneous. It relates more to personality theories of development by philosopher like Rousseau and others. The Montessori Method is an approach of active learning, independence, co-operation and letting the child set its own pace of development (Adefunke T. & Olatunde, 2015; Schilling, 2011).

The above discussion helps the educator to understand the learner and identify some of the aspects that will make the lesson content understandable and interesting. The relationship between the educator, the learning styles of a student and lesson content is cordial in that there will be an understanding between them.

## 2.5 Academic Performance and Study Habits in Mathematics and Other Subjects

The population of South Africa has grown phenomenally since the independence of South Africa in 1994. One of the factors that have contributed to this growth is migration of nationals from the different parts of Africa seeking asylum in South Africa. This has caused the population of the country to be multinational and multicultural. South African citizens have moved from the rural areas to the urban areas resulting into squatter camps. It is not only the people from the continent of Africa but some from other countries like Europe, India, China, the Americas and Australia. This also contributed to a racially integrated country after the abolition of the racial discriminatory laws of the apartheid system. This influx of immigrants to South Africa has impacted on its demography and socio-economic status causing a multilingual and multicultural society. The education system has therefore been affected by this phenomenon. A problem of poor academic performance in the high school sector which is the gate to the higher education for development created a concern which also resulted in a myriad of changes in the education system. One of those is the introduction of Mathematical Literacy which was considered to alleviate the problem of  poor academic due to mathematics being considered to be a difficult subject that caused a high failure rate.

There are numerous aspects that impact on this problem. The educators and learners have to adjust to the different spheres of environment. To mention just a few, learners have to adjust to the language of the medium of instruction which at times some nationals have different accents compared to what a South African learner is used. Vice versa, the foreign national learners find themselves in a different situation than back home. To overcome these impediments, students are to develop some study skills and habits so as to perform better in class. In most instances, students who do not perform well in class: is it because they do not have adequate study skills or is there something else that is not identified by the educator? This mostly applies to Mathematics which is regarded as a difficult subject (Reddy, et al., 2016). Table 2.3 below shows the results for the years 2007 and 2008. It is worth examining as to the reason of not having an improvement in the results of some of schools. By the average the results for South Africa show a downward approach instead of an improvement. This is a phenomenon that does not usually occur

in most instances. It is the expectation that there will be an improvement in the year end results after some changes have occurred.

One of the contributors to these findings argues that some weaker potential students are pushed out of the system before taking the final examinations. This results in better results that show improvement especially in mathematics. This have been the case in the previous year, that is, the year 2007. Five provinces, example, Eastern Cape; Kwa-Zulu Natal; Limpopo; Mpumalanga and the Western Cape showed a drop in the pass of the learners. The Eastern Cape, Kwa-Zulu Natal and Limpopo usually have poor results, with the exception of the Western Cape. The reason may be that some learners from the Eastern Cape moved to the Western Cape.

**Table 2.2: A comparison pass rates of the NSC – DoE Stats. (2008)**

<b>Comparing pass rates of the National Senior Certificate examination, by province, in 2007 to 2008</b>		
<b>Province</b>	<b>Pass Rate (%)</b>	
	<b>2007</b>	<b>2008</b>
<b>Eastern Cape</b>	57.1	50.6
<b>Free State</b>	70.5	71.6
<b>Gauteng</b>	74.5	76.3
<b>KwaZulu-Natal</b>	63.5	57.2
<b>Limpopo</b>	58.0	54.7
<b>Mpumalanga</b>	60.7	51.7
<b>Northern Cape</b>	70.3	72.7
<b>North West</b>	67.2	67.9
<b>Western Cape</b>	80.6	78.7
<b>South Africa</b>	<b>66.9</b>	<b>64.6</b>

Recently, a survey was conducted on the schools that found to be performing poorly. The schools in the Eastern Cape, Kwa-Zulu Natal and Mpumalanga have always been identified as the poorest performing schools in the Republic of South Africa. Even in the previous years there has always been a problem with these schools (Govender, 2018).

According to the article published in the weekend newspaper, the researchers decided to choose thirty-five (35) high school teachers and twenty-two primary school teacher. These were to be interviewed and observed in the classroom during the teaching hours (96 lessons). Six were able to do simple math calculation. Teachers scored as low as ten percent (10%) for English and five percent (5%) for Mathematics. Only five (5) of the twenty-two (22) primary school teachers scored sixty-six percent (66%) in English.

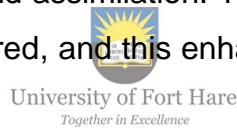
The researcher suggested the following impediments in poor performance which are:-

- a. The appointment of 'inappropriate' candidates to promotions posts;
- b. Ineffective in-service training;
- c. The use of time in schools;
- d. Ineffective institutional leadership practices by subject advisers and school leaders; and lastly
- e. A lack of appropriate initial teacher education programs for trainee teachers at the universities (Govender, 2018).

Academic performance is the end product of rigorous activity in trying to collect, interprets, memorize and apply the new information. There are also other factors that influence academic performance such as the grades that the learner gets during the course of the year. It may happen that some learners get discouraged by the marks they received and end up reverting to self-pity not concentrating on the studies (Schunk, 2012). Others may have a different view of the grades and decide to study better and look for help from the educator. Unfortunately most educators in the lower levels of schooling are not available because of the distance from school and also they have some other commitments apart from school work or attending classes at the universities (Leary, 1995) (de Costa, 1996; Busato, 2000; Allias, 2014). The grading system with the requirements as of taking into accounts the assignments or homework done accounts for the grades affects performance. Learners may be given some assignment to research using the internet and may have no access to the internet or lack data bundles for internet connection. The use of the library for research purposes or outside reading with rural schools is not accessible. Others do not even know how to use a library. Doing outside reading and using libraries encourages study habits because of the interesting information learners get from reading (Jansen, 2009; Kohn, 2011; Lawrence, 2014).



Study habits are an initiative process that needs to be learned, acquired and practiced on a daily basis becoming part of the learners and students. The matriculation results only show the consequences of poor academic performance overlooking where it begins. The lower levels or lower grades are overlooked by the Department of Basic Education. Learners who do not have the foundation at the lower level are left out and it is very difficult for them to catch up at an advanced level of high school (McCarthy, 2013). For students to perform well academically, they are to have effective study habits as these have been identified as having an impact on academic achievement at a lower level of education. Study habits are acquired through time management, study environment preparation skills and motivation (Ghulam, 2013). To be specific, learners are to learn to be prepared for each subject they are to take every day not when the examinations are at hand. This gives a learner time to reflect on the subject under study and also the honing of the skills acquired (Oluwatimilehin, 2012). Nadeem (2014) asserts that, efficient learning depends on well-developed study habits which produce better results in acquired information and its interpretation and assimilation. The learner is therefore able to apply the knowledge whenever it is required, and this enhances better academic performance among learners (Rasul, 2011).



The table below shows the results for the years 2007 and 2008. It is worth examining the reasons of not having an improvement in the results of some of schools. On average, the results for South Africa show a downward approach instead of an improvement. This is a phenomenon that does not usually occur in most instances. It is an expectation that there will be an improvement in the year end results after some changes have occurred. One of the contributors to these findings argues that some weaker potential students are pushed out of the system before taking the final examinations. This results into better results that show improvement, especially in mathematics. This has been the case in the year 2007. Five provinces, for example, Eastern Cape; Kwa-Zulu Natal; Limpopo; Mpumalanga and the Western Cape showed a drop in the pass of the learners. The Eastern Cape; Kwa-Zulu Natal and Limpopo are usually having poor results with the exception of the Western Cape. The reason may be that some learners from the Eastern Cape moved to the Western Cape.

The Gross Domestic Product (GDP) of South Africa is one of the highest in Africa. It is regarded as the second to developed countries. On the contrary, academic performance of the high school learners is very poor. The Trends in International Mathematics and Science Study (TIMSS) rates South Africa at the bottom. When comparing South Africa to South Korea, Singapore and Botswana it is features very low. Singapore is one of the best countries in education so is its GDP. Notwithstanding South Africa with its highest GDP in Africa, its education does not tally with its development. This is a phenomenon which requires a lot research (Reddy, et al., 2016).

According to Oluwatimilehin, Nigeria has a large scale of failure report which is causing concern among the stakeholders. He cites Isangedighi that indiscipline, drug addiction, poor socio-economic background of parents and some other factors that impact negatively on the education system. It is alluded that a 'reduction in test-anxiety is no guarantee of subsequent improvement in academic performance when the level of study habits and competence is ignored' (Oluwatimilehin, 2012).



## **2.6 Mathematical Literacy as Correlated to Study Habits and Learning Styles**

The introduction of Mathematical Literacy in the systems of education of the different countries was to address the problem of poor academic performance due to the perceived assumptions that the Mathematics subject was one of the difficult subjects. In most instances, there was a tendency of saying that the individuals who did Mathematics were more intelligent than others. People tended to shy away from Mathematics because of these projected ideas. Based on these assumptions and perceptions, Mathematical Literacy was introduced to different parts of the world at different periods. The most important question was: was Mathematics the cause of poor academic performance or there were some other underlying reasons or causes for this poor academic performance? It may be that the educators did not have a good understanding of mathematics and were unable to explain it to the learners. It may have been that learners were difficult to teach or slow learners who would cause the educator not to finish the

syllabus on time and did not want to take the blame or not enough equipment, environment, stationery and the rest.

### **2.6.1 Background to the Introduction of Mathematical Literacy in Education System**

It is necessary to look at the history and the background of the introduction of Mathematical Literacy in the different systems of education. As it had been indicated before, Mathematics is regarded as the backbone of technology and development. Students who excel in Mathematics have better opportunities to do further studies on scholarship and bursaries. They also have preferences in getting employment in public and private entities because there is a big demand for such students. One of the reasons for these preferences is that a Mathematician is regarded as someone who has capability, critical thinker, analytic in doing things and logical approach. Due to these assumptions, learners are encouraged to study Mathematics. Unfortunately, in most instances, Mathematics and Physical Sciences have been a problem in most countries as revealed in the Trends of International Mathematics and Science Studies (TIMSS). It is through education as a means of equipping the upcoming generations with tools to be able to get jobs and getting involved in the development of the countries. The lack of an emphasis on mathematics and sciences in education discourages development. The country will lag behind in technological development and industry. It will lack intellectuals, developers and academics.

It is because of the above mentioned assumptions that Mathematical Literacy was introduced in the education systems of the different countries of the world. The idea of the Mathematical Literacy introduction is based on the scientific and technological development race. This is evident in the American system of education when it was made compulsory to do mathematics in schools (Hurd, 1972). It was caused by the development of the Russian spaceship or rocket known as Sputnik. Also during the introduction of communism which brought a lot of development in which Nikita Khrushchev commented that they were dizzy with development. This caused concern within the Western countries; especially on development (Hurd, 1972). According to TIMSS; the United States of America (USA) has been lagging behind compared to its contemporaries. To cope with this matter; Mathematical Literacy was introduced. Australia and South Africa followed

suit at a later stage. This background gives an idea as to why Mathematical Literacy was introduced in these different systems. There may have been more reasons that caused these changes though the poor academic performance was the main.

### 2.6.2 Meaning of Mathematical Literacy

Mathematical Literacy is composed of two words which give an explanation of the meaning of the subject. It can therefore create a little bit of a problem when being defined in a literal sense. Mathematical Literacy can be defined scientifically and technically (Ic, 2017).

- a. The scientific perspective of Mathematical Literacy is when it is used as a subject that the learners are to study, understand and apply. As a subject it is practical as compared to mathematics which is abstract. On the other hand, mathematics is used as a means of critiquing, making models and analysis. This includes geometry, algebra, measurement or quantifying and estimation using charts and graphs.

Mathematical Literacy is more on the application process, data analysis, contextualizing mathematics but not mathematically involved. The other systems of education refer to as numeracy since it is more on the arithmetic context. This means that one is to be familiar with numbers, the knowledge of addition, subtraction, multiplication and division. The learner is not required to solve equations or any mathematically related problems.

- b. The technical perspective of Mathematical Literacy is when one needs to first understand the meaning of the two words it is composed. There are two words put together, namely, mathematics and literacy.

The qualifying word is literacy which qualifies mathematics and can create confusion in the literal analysis of the subject. Literacy means one who is able to read and write or someone who is educated and intelligent who enjoys literature. This can mean a mathematician not the way it is understood in the context of the South African education system.

Mathematical Literacy can be confused for someone who has a lot of knowledge in mathematics as how Hurd defines scientific literacy, that is, replacing scientific with mathematical (Hurd, 1972; Hurd, 1997).

Many definitions have been put forward for scientific literacy since Paul DeHart Hurd used the term in 1958. Norris and Philips (2003) contend that the term scientific literacy has been used to include various components from the following:

- a. Knowledge of the substance content of science and the ability to distinguish from non-science;
- b. Understanding science and its application;
- c. Knowledge of what counts as science;
- d. Independence in learning science;
- e. Ability to think scientifically;
- f. Ability to use scientific knowledge in problem solving;
- g. Knowledge needed for intelligent participation in science-based issues;
- h. Understanding the nature of science, including its relationship with culture; and
- i. Appreciation of and comfort with science, including its wonder and curiosity.



Prior to the introduction of Mathematical Literacy as a subject to the South African system of education, there were many concerns about it. Basically, Mathematical Literacy deals with quantity, example, data analysis, critical thinking, etc. The American system of education refers to it as quantity literacy whereas the United Kingdom and Australia refer to it as numeracy. It is mainly concerned with mathematics used in the context of daily life experiences. Some researchers suggest that this subject should be integrated to other subjects like Life Orientation. Since it deals with numeracy, some educators simply put an emphasis on Mathematics (Bowie, 2006; Frith, 2009).

Another definition by (Ic, 2017) using the concept of Ersoy (2003) gives a concise definition of Mathematical Literacy.

Ersoy (2003) stated that an individual with mathematical literacy skills could predict the outcome by conducting mental operations about the probable solution of the problem, judge the accuracy of the result and use numerical intuition to interpret

the measurements (Ersoy, 2003). Accordingly, having mathematical literacy skills requires certain basic skills and competences in mathematics at different levels. These skills and competences include a wide range of skills such as mathematical operations, mathematical thinking and conceptualization, as well as having knowledge on and practice a range of mathematical content (EARGED, 2008).

The above definitions give an understanding that Mathematical Literacy is based on the precepts of being easy to understand and provide the knowledge that is required for learners who are having challenges in doing Mathematics. The expectation by the education system of South Africa in the introduction of Mathematical Literacy in 2008 was to get better matric results (Education, 2008). According to the ANA Performance on Grade 11, 2014 the results were not as good as expected especially in the Eastern Cape. This can be attributed to the fact that educators were not yet familiar with the new subject being introduced and also the learners were still struggling to adapt to the new subject which both of them were grappling to understand. In the introduction of the mathematics literacy the educators use the same methods of teaching (Vithal, 2006; McCarthy, 2013). In 2016, the year end results indicated that Mathematical Literacy was still the subject that had the lowest academic achievement compared to the other subjects. The figure below shows that phenomenon.

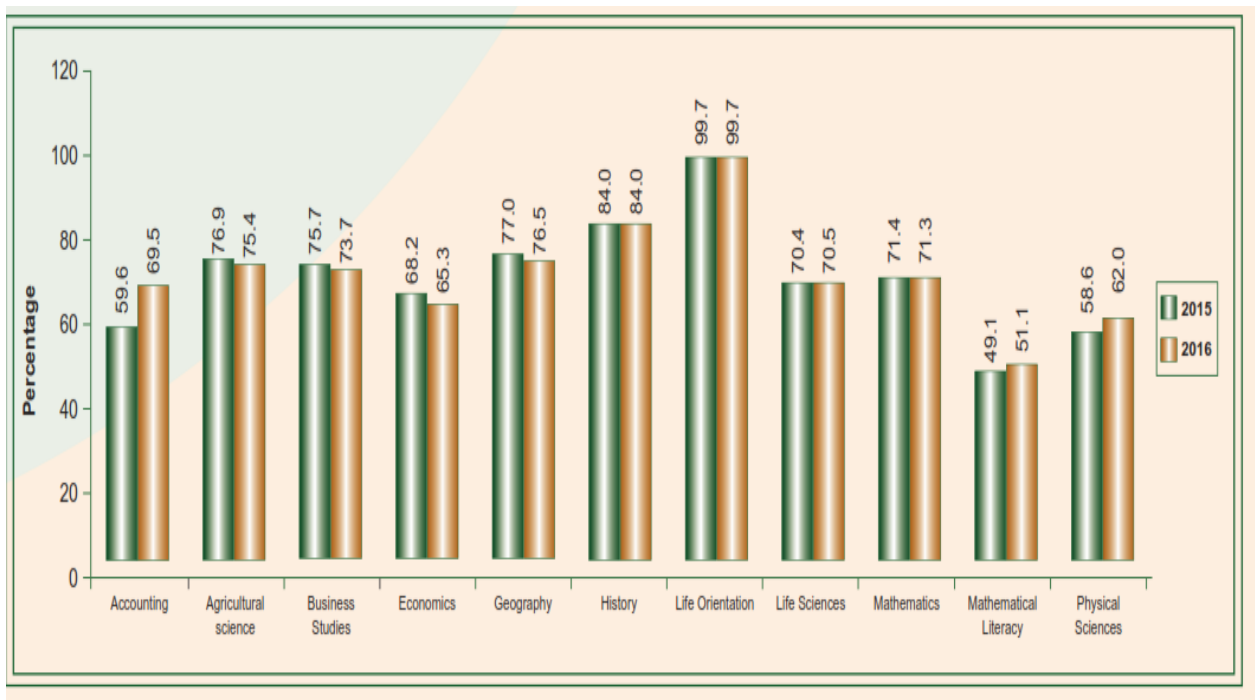


Figure 2.5: Percentage distribution of the National Senior Certificate examination achievements at 30% and above for selected subjects in 2015 and 2016.

**Source: Report on the 2018 National Senior Certificate Examination Results, DBE (January, 2017)**

The data in Figure 2.5 is an indication of the fact the South African system of education lowered the pass mark to 30%. The 30% pass mark was not effective in that, the Mathematical Literacy subject academic achievement did not improve. This is a period of about ten years (10) since its introduction. The Life Orientation which was also introduced almost at the same time with Mathematical Literacy had the highest academic achievement to the rest of the other subjects in the National Senior Certificate results with a 99.7% which is almost 100%. Mathematical Literacy had a 51% academic achievement. This is an indication that there are some underlying factors which influence the pass rate. Looking at some of the indicators in Table 2.3 will provide an understanding as to why the academic performance in Mathematical Literacy was the lowest in all the subjects in the National Senior Certificate results.



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**Table 2.3: Number of learners, educators and schools, and learner-educator ratio (LER), learner-school ratio (LSR) and educator-school ratio (ESR) in the ordinary public and independent school sector, by province, in 2016 (Education, 2018)**

Province	Learners		Educators		Schools		Indicators		
	Number	As % of National Total	Number	As % of National Total	Number	As % of National Total	LER	LSR	ESR
Eastern Cape	1 961 547	15.2	61 629	14.7	5 676	22.2	31.8	346	10.9
Free State	688 349	5.3	23 523	5.6	1 282	5.0	29.3	537	18.3
Gauteng	2 326 584	18.0	82 078	19.6	2 813	11.0	28.3	827	29.2
KwaZulu-Natal	2 877 544	22.3	89 799	21.5	6 142	24.0	32.0	469	14.6
Limpopo	1 765 555	13.7	54 418	13.0	4 018	15.7	32.4	439	13.5
Mpumalanga	1 074 352	8.3	34 404	8.2	1 847	7.2	31.2	582	18.6
Northern Cape	292 595	2.3	9 136	2.2	574	2.2	32.0	509	15.9
North West	829 467	6.4	26 108	6.2	1 534	6.0	31.8	541	17.0
Western Cape	1 116 572	8.6	37 518	9.0	1 687	6.6	29.8	662	22.2
<b>South Africa</b>	<b>12 932 565</b>	<b>100.0</b>	<b>418 613</b>	<b>100.0</b>	<b>25 574</b>	<b>100.0</b>	<b>30.9</b>	<b>506</b>	<b>16.4</b>

In the table, three provinces are used for comparison on the number of learners, educators, schools and indicators. The provinces are the Eastern Cape, Gauteng and the Western Province. The statistics were for the results of the year 2016.



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Province	Learners	Educators	Schools	Indicators		
	Number	Number	Number	LER	LSR	ESR
Eastern Cape	1,961,547	61,692	5,676	32.8	346	10.9
Gauteng	2,326,584	82,078	2,813	29.3	827	29.2
Western Province	1,116,572	37,518	1,687	29.8	662	22.2

**(LER = Learner-Educator Ratio; LSR = Learner-School Ratio and ESR = Educator-school ratio)**

The Eastern Cape had the highest number of schools compared to the other two provinces, that is, Gauteng and Western Cape. It had also less educators than learners. The Gauteng province had less schools more educators than learners but on the other



hand had the highest number of learners. The Western Cape province had a less number of schools more educators and less learners.

The year end results for 2016 in the National Senior Certificate showed that the more educators than learners, the better the results and this is evident in the table below.

### Admission to Higher Education

Province	Matric Candidates	Degree Level	Diploma	FET	Pass
Eastern Cape	82,902	18.9%	24.9%	16.3	59%
Gauteng	103,829	36%	35.8%	13.1	85%
Western Cape	50,869	40.9%	32.1%	12.9	85.9%

This is an indication that a provinces that had more educators than learners had an advantage and performed well academically. The learning process therefore is also affected by the number of educators in an institution.

## 2.7 Educator and Learner in a Classroom



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Learning is not just a classroom full of learners eager to be taught and go home happy, it is not only the educator who is imparting knowledge to the learner because learning does not operate in a vacuum. The classroom, the learner and the educator impact on each other. The classroom can be conducive to learning or the other way round. The learner may come to a classroom having some problems that need to be identified. The educator can get into a classroom not prepared for the lesson because of some circumstances that cannot be overcome hence there are some complexities in learning.

The complexities may be found in gender biases that may still exist in academic performance. This can be caused by lower female representation in key positions of administration and other important occupations that reflect gender inequalities. Based on this notion, some studies have indicated that in Mathematics and Mathematical Literacy in countries like Lesotho, females do not perform well and are to do home economics instead of mathematics (UNESCO, 2011 - 2012). Four countries that participated in Program for International Student Assessment (PISA) showed significant difference in

academic performance between males and females. The other results were in favor of females and others favored males (Perkins & Quaynor, 2011).

The concept of learning styles by learners and the imparting of knowledge by educators is therefore very complex. It is suggested that the imparting of knowledge to the learners includes the teachers' understanding of the subject matter or the topic to be presented. On the other hand, the learner may bring in the classroom conceptions and misconceptions about the subject to be taught (Bayazit, 2004). The learner may also be hearing for the first time the information being taught and will need to process it.

'Learning style is the type of preference for learning that appears in each information process, which is a constant tendency of the learner and method toward handling each person's knowledge' (Bayazit, 2004).

The interaction between the learner and the educator should produce positive results. There should be a feedback between the learner and the educator resulting in harmonious communication and the understanding of the subject matter. Harmonious communication is a two way process whereby the educator and the learner are communicating and understanding each other. It also involves the language of the medium of instruction. Fortunately for other countries, there is only one official language unlike the Republic of South Africa where there are nine vernacular spoken languages in which two languages like English and Afrikaans are popularly used as medium of instruction. This poses a problem for those learners who use English and Afrikaans as a second language.

The most popularly used method of instruction is the pedagogical approach in the different education systems of the countries worldwide especially in South Africa. This is a teacher-centered model where the educator is the transmitter of knowledge and the learners are somewhat passive in that they have to listen attentively to the educator. It is also meant for young learners who are still below adulthood and need to be guided in pursuit of knowledge.

There are different definitions of pedagogy, and Dolezalova and Habl (2014) define it in a more inclusive and detailed approach which is rendered as follows:

Pedagogy is an independent social anthropomorphic science (science about humans). It represents an organized system of findings about educational processes and its results, conditions and factors that determine the education, as well as the main agents of the process. Pedagogy studies education in its versatility and diversity.

Pedagogy describes, explains, compares, evaluates and generalizes the findings about pedagogical phenomena. It reveals and formulates the pedagogical principles and rules which reflect the relationships and connections in educational practice. Based on these findings, pedagogy proposes constructs and concepts (theories, models, plans) which are subsequently verified in practice. The findings are thus specified and a pedagogical theory is developed, together with other fields within interdisciplinary character. In other words, pedagogy is a normative science (formulating norms, rules, principles and guidelines for education and upbringing) and a descriptive science. It is also an explorative science (exploring and studying new educational phenomena), as well as an explanatory science (identifying and explaining processes, results and factors of education), which is an essential activity for pedagogy.

And last but not least, it is a projecting science (proposing new and more effective processes, resources or entire programs). Sometimes, the aforementioned attributes are all described as functions of pedagogy. Pedagogy is concerned with all forms and means of education (in family, at school, extracurricular and media effects) and pays major attention to anthropogenic factors of education. Another definition is based on the interpretation of the word pedagogy which is derived from the Greek word, *paidagogos* – in English it is pedagogue, meaning child-tender. Moulton (1977) renders it a slave freedman, to whom care of the boys of a family was committed, who was to attend them at their play, lead them to and from public school. The idea is based on the Greek New Testament which the present schooling and education system derives its pedagogical approach. The Judea-Christian and Greco-Roman traditions from family-centred to the teacher-slaves were adapted to this education system (Moulton, 1977).

In the pedagogical approach the teacher is the center of information. The learners are to follow the instructions given by the teacher. The use of testing is a means of identifying whether the learners have understood the lesson. The process of pedagogy was used in the training of priests to indoctrinate them about the belief system and doctrines of the specific religion or faith during the Middle Ages. During the period of Enlightenment, pedagogy became scientific and theories were developed on it. In other words, the education system inherited the idea of pedagogy from the church and used this as a means of transmitting the information to the learners (Dolezalova & Habl, 2014; Kestere, n.d.; Conner, 1997).

The above discussions on pedagogy confides itself in 'pupil' relationship with an educator. Learner depends on the educator for the information. On the other hand, Dolezalova and Habl (2014) give a more expanded definition which is more related to Conner's (1997) on adult education which is referred to as **andragogy**. Andragogy is also derived from the Greek language based on two roots which are: - Agogus – meaning to lead and Andra – meaning adult (Conner, 1997). Pedagogy has also their root in Greek as follow: - Peda (paida) – meaning child. The andragogy model, according to Conner (1997), has five aspects:



- a. Letting learners know why something is important to learn;
- b. Showing learners how to direct themselves through information;
- c. Relating the topic to the learner's experiences;
- d. People must be ready and be motivated to learn; and
- e. Help in overcoming inhibitions, behaviors and beliefs about learning.

Knowles makes a comparison of andragogy and pedagogy and some parallels that can be identified or there is a relationship in both models. In the comparison of andragogy and pedagogy it can be assumed that andragogy can also be used in the learning process by the educators for pupils who are at the lower levels (Knowles, 2013). The table below shows comparisons between pedagogy and andragogy.

**Table 2.4: A comparison of Pedagogy with Andragogy by Knowles (2013)**

	Pedagogical	Andragogical
The Learner	<ul style="list-style-type: none"> <li>• The learner is dependent on the instructor for all learning</li> <li>• The teacher/instructor assumes full responsibility for what is taught and how it is learned</li> <li>• The teacher/instructor evaluates the learning</li> </ul>	<ul style="list-style-type: none"> <li>• The learner is self-directed</li> <li>• The learner is responsible for his/her own learning</li> <li>• Self-evaluation is characteristic of this approach</li> </ul>
Role of the Learner's Experience	<ul style="list-style-type: none"> <li>• The learner comes to the activity with little experience that could be tapped as a resource for learning</li> <li>• The experience of the instructor is most influential</li> </ul>	<ul style="list-style-type: none"> <li>• The learner brings a greater volume and quality of experience</li> <li>• Adults are rich resources for one another</li> <li>• Different experiences assure diversity in groups of adults</li> <li>• Experience becomes the source of self-identity</li> </ul>
Readiness to Learn	<ul style="list-style-type: none"> <li>• Students are told what they have to learn in order to advance to the level of mastery</li> </ul>	<ul style="list-style-type: none"> <li>• Any change is likely to trigger a readiness to learn</li> <li>• The need to know in order to perform more effectively in some aspect of one's life is important</li> <li>• Ability to assess gaps between where one is now and where one wants and needs to be</li> </ul>
Orientation to Learning	<ul style="list-style-type: none"> <li>• Learning is a process of acquiring</li> </ul>	<ul style="list-style-type: none"> <li>• Learners want to perform a task, solve a problem,</li> </ul>

	<p>prescribed subject matter</p> <ul style="list-style-type: none"> <li>• Content units are sequenced according to the logic of the subject matter</li> </ul>	<p>live in a more satisfying way</p> <ul style="list-style-type: none"> <li>• Learning must have relevance to real life tasks</li> <li>• Learning is organized around life/work situations rather than subject matter units</li> </ul>
Motivation for Learning	<ul style="list-style-type: none"> <li>• Primarily motivated by external pressures, competition for grades, and the consequences of failure</li> </ul>	<ul style="list-style-type: none"> <li>• Internal motivators: self-esteem, recognition, better quality of life, self-confidence, self-actualization</li> </ul>

### **Pedagogy versus Andragogy**

According to Dolezalova and Habl (2014) pedagogy was designed to lecture young boys by monks in the monasteries during the Middle Ages. These young learners were to display obedience, change of attitude, faith and become faithful servants of the church. Accordingly, it was the science of teaching children as depicted by its name. Basically, learners were to know what the teacher knows which created a dependence on the educator. Learners were rewarded by passing the level and punished by failing and to repeat the class. Coming to andragogy, is meant for adults according to its definition and it came into acceptance in the education system during the 1900's. On the other hand, Knowles as a proponent of andragogy first defines pedagogy as an 'art and science of teaching children' which is a teacher centered approach. He continues to define andragogy as an 'art and science of helping adults to learn.' It is a learner centered approach which is opposite of pedagogy. In both approaches the purpose is to create a learning environment in a classroom. At the end of each process there is a reward on both groups of learners. One group that is composed of the adults receives a diploma or certificate. The diploma or certificate may be received at the end of a specific period for that purpose of study. It depends on the purpose which may be a week or more to even a year or two.

The group that is composed of the children has a longer period which is based on levels or grades. It also depends on the system of education which is adopted in the specific country. But, the common period is twelve years combining all the grades. According to Knowles' assertion, adults are self-motivated whereas young learners are encouraged to learn. This also depends on the grades or level of study in which they are studying. Kolb in his theory of learning styles subscribes to both the pedagogical and andragogy. The perception or idea of an educator as a mentor and a guide in experimentation (activity) and observation which is the reflection of what has been observed belongs to the pedagogical approach. The conceptualization belongs to andragogy because it relates to experience in which Knowles submits that adults come to the classroom with some experiences. Vermunt, in cognitive theory, asserts that cognitive processing strategies relate to learning new information through referring the new information to the old. This also supports Knowles' andragogy approach. Covey, in study habits, has the knowledge which entails the 'what to' and 'why to'. These phrases describe the desire to learn and study to acquire knowledge based on study habits. The desired skills in Covey which are as a result of study habits also related to andragogy. The time management on studies belongs to both pedagogy and andragogy. Learners are taught time management to enable them to cope with their studies. For effective learning in the classroom, the educator has to draw a common time table for the classes which is followed during class periods which is a guide for the daily activities. The learner will also draw his/her own personal time table to create time for the homework and assignments. Learning styles and study habits both involve pedagogy and andragogy approaches according to the above discussions.

Rismiyanto et al. (2017) submit that since learning requires both pedagogy and andragogy, educators will miss the point in trying to impose andragogy on adult learners. Using both pedagogy and andragogy in educating young learners will be a paradigm shift from only pedagogy, which is a passive approach. Educators must be able to create an environment that is conducive to effective learning by identifying a situation or subject that will need andragogy or pedagogy. The classroom is like a workshop for an educator where all the needed tools are stored to effect the meaningful learning process. The end product is better academic performance which is determined by good grades for the

pupils or learners. Schunk (2012) cites Shnell (1986) that, 'there is no one definition of learning that is universally accepted by theorists, researchers and practitioners'. According to Schunk, learning is an enduring change in behavior or in the capacity to behave in a given fashion, which results from practice or other forms of experience. It is also suggested that teaching is focused on content rather than context.

The above theorists discuss the learning process in a classroom. The emphasis is on the learners and the experiences they go through. The above discussion affects both the learning styles and study habits which is an emphasis on the study. Learning styles subscribes to both pedagogy and andragogy and relates to the approach of the South African system of education. The Grade Eleven (11) who belongs to the adult group or young adults because they have already gone through the adolescence are the main focus on the study. According to the South African legal system, adulthood starts at the age of eighteen (18) years, which is inclusive of the Grade Eleven learners.

## **2.8 Empirical Studies and their Commonalities and Differences**



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The available studies on study habits and learning styles shed light to understand and evaluate how the other researchers view study habits and learning styles as they relate to academic achievement. Is there enough evidence that study habits and learning styles have an impact on learning experience? The commonalities and differences are used as a deciding factor whether learners are affected by these two variables in the process of learning that results in better or poor academic achievement.

### **2.8.1 Study Habits and the International Perspective**

There is limited research-based literature related to study habits in South Africa. This is inclusive of study habits in the subject of Mathematical Literacy. Many studies on study habits have been conducted in various countries looking at the students' study habits in different subjects and at various levels of education and not specifically in Mathematics Literacy. In this sub-heading; the available studies on study habits reviewed are the reflections of the international and not in the South African context or perspective. The




data is collected from a specific target population using the tools that are reliable and valid to conduct the researches hence the studies were published in the journals that have a good track record for publishing credible studies. In Pakistani, Bajwa et al. (2011) conducted a study making a comparison of formal and informal education and its relationship to study habits. Distance education was put in the category of informal education since students do not have a daily interaction with and instructor. The study was conducted in the Islamic University of Buhawalpur using a sample of 500 students who responded to a questionnaire. The questionnaire had forty items on five point scale and based on seven clusters, namely, time management, planning, class attendance, and general study strategies, preparation for examinations, goal setting and motivation.

The findings were that students on formal education were competent in time management, were actively involved in classroom participation and used proper preparation for examinations. Students in informal education considered note taking as an important strategy. Cerna and Pavliushenko (2015) conducted a study on academic performance of international college students on the influence of study habits in Shanghai. They found that cultural aspects may affect positively or negatively the study habits of international students. In an earlier study conducted in India, Lawrence (2014) investigated the relationship between study habits and anxiety among secondary school students. It was conducted by Lawrence (2014) and sampled five hundred (500) students from ten (10) high schools. Due to the volume of the study, the researcher used for analyzing the data the researcher used SPSS software and used percentile analysis, standard deviation, t-test and Pearson's product moment correlation.

The findings were that, there was significant relationship between anxiety and study habits. The study showed that students with good study habits have less anxiety when faced with examinations and perform well academically. The instrument used by Lawrence to collect data was developed by V. G. Anathan for measuring study habits. The findings supported Ananthan (2004) and Samy (2007) who also found out that the level of study habits and achievement was moderate. On the other hand; when hostel-dwelling students were factored in by Lawrence (2014) it showed that hostel-dwellers had better study habits. A study by Lawrence (2014) contradicted the earlier study by Doss

(2012) which indicated that day-scholars had better study habits. Perhaps some factors may have been overlooked by Doss (2012). Uju and Paul (2017) investigated the study habits and its impact on secondary school students' academic performance in Biology in the Federal Capital Territory in Abuja, Nigeria. These investigators found a significant relationship between study habits and secondary school students in academic performance. According to Marc (2011), every student is supposed to develop good study habits and this helps to boost self-discipline and self-directed ability to function.

The research in study habits reveals that students are supposed to be able to plan and manage their time. It is conclusively accepted that study habits have a significant relationship with academic performance. The different researchers from different countries used various instruments on different types of students, that is, high school and university students have found out that study habits are essential for better academic achievement. A study on predicting grades in Mathematics and English through study habits was conducted by Magno (2010) in the Philippines. The sample was 259 high school students who attended public and private schools. The students were from eleven (11) to fifteen (15) years old. The questionnaire was based on the following factors:

- 
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- a. delay avoidance – measures how prompt the student to complete the assignment;
  - b. work methods – effectiveness in study skills or habits;
  - c. teacher approval – opinion of students about teachers; and
  - d. education acceptance – student approval of educational objectives, practices and requirements.

The researcher used an old instrument for study habits, namely, Survey of Study Habits and Attitudes (SSHA) which was developed by Brown and Hultzman (1956, 1957). The instrument is regarded as reliable and valid in that the predictors of grades Confident Interval of 95% means that the score was accurate. Cronbach's alpha value of .78 to .90 showed that the participants were consistent in their responses. Validity of SSHA showed convergence of the correlation among the four factors. Work methods was more significant in Mathematics which indicates that Mathematics needs good study habits. Delay avoidance, teacher approval and education acceptance were significantly related to the English subject because the study was on both Mathematics and English as predictors of study habits.

## 2.8.2 Study Habits and the South African Perspective

There were very few studies that were found in literature study habits of South African students. Some studies looked at related variables but not precisely the study habits. For example, Allais (2014) discussed the lowering of the matriculation examination pass rate to 33% which produces students who cannot cope with the requirements for the higher education level. The lowering of the pass rate in the students' final matriculation results created school drop outs or poor performance of students at the higher level of education due to unpreparedness (Letseka, 2008).

In a more recent study Fouche (2017) investigated the influence of study habits on the academic performance of post-graduate students in one of the South African universities. The study investigated study habits and time-management trends of post-graduate students in accountancy. The researcher looked at the study habits and time management with the analysis of the environment of the post-graduate students.

Fouche (2017) developed his own instrument for data collection which was based on the experience with the students. The factors that were used were:



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- a. Academic support;
- b. Class attendance;
- c. Individual commitment and effort;
- d. Time management;
- e. Motivation;
- f. Attending additional help and tutorial;
- g. Consistent study;
- h. Stress management;
- i. Work-life balance and extracurricular activities; and
- j. Study and examination techniques.

The study took two years using sequential exploratory mixed method. In the first year, the researcher had 173 students responding to the questionnaire that was prepared by the researcher using his own experience. This was followed by interviews to a focus group which was randomly selected from a class list with eight (8) to ten (10) students. The following year consisted of 161 students following the same procedure.

The researcher reported that study habits had a significant relationship with time management. Managing and planning what to study and when, is very significant for learners to be able to perform well academically. The researcher used Microsoft Excel to analyze the first questionnaires and used *Atlas ti* to analyze the interviews. The results were that, half of the students that participated were able to manage their time and succeeded in their examinations. The study corroborated the other studies that were conducted in different countries (Aquino, 2011; BILGE, et al., 2014; Siahi, 2015).

### **2.8.3 Learning Styles and International Perspective**

The research on learning styles is vast, with different definitions to simplify the process of learning for a better understanding so as to provide assistance to educators (Bloom, 1971; Busato, 2000; Cassidy, 2004; Dunn, et al., 2010). Different studies have been conducted on students and also workers, because learning is also required for specific jobs in the work market. Employers need efficient employees that are productive and are able to provide a good turnover with efficiency. It therefore depends on the education system to provide these skills and qualities through the students who have good academic achievement and dedicated to their work. Competence is also one of the expectancies from the workers for the execution of their duties (Dunn, et al., 2010; Oosthuizen, 2014).

The above discussion is based on the learning process in which studies are dedicated into finding the proper approach into learning. Theories in learning styles have been established to help guide researchers in their investigation. An examination of the relationship between eighth grade students' learning styles and attitudes in mathematics was conducted by Aydin (2016). The purpose of the study was to determine if there was a relationship between learning styles and attitudes towards mathematics among the grade eight learners in Central Anatolia, Turkey. A sample of 100 eighth grade learners was used for the study. The instrument used in the study was the one developed by Kolb (2005), that is, Kolb Learning Styles Inventory (LSI). This is a reliable instrument used in different studies. Moreover, Kolb is one of the proponents of learning styles. The other tool that was used was the Attitude Scale toward Mathematics class to measure the

attitude of the participants towards Mathematics. This is also a reliable scale that was developed by Askar (1986). The completion of the questionnaires and scales took 40 minutes using the SPSS 14 software and Microsoft Excel in the analysis of the data. Factors that were used in the learning styles were based on Kolb's theory of learning styles. The factors were: a. assimilating; b. accommodating; c. diverging and d. converging.

The results in the analysis indicated that assimilating learning was significant and accommodation was not significant. Female learners had more assimilating learning styles whereas the male learners were divergent in learning styles. The conclusion was that students have different learning styles, which was evident in the assimilating process in the female learners and divergent in the males. This prompts the educators to be aware of these differences of learning styles among learners, especially in mathematics. This is also relevant even to other subjects such as Mathematic Literacy. Lee and Kim (2014) argue that *'learning styles should be discussed relative to the learning content'* (Lee & Kim, 2014:118, citing Dörnyei, 2005). Their argument is based on their study that they conducted in a university in Korea. The study was based on 496 students who responded to their questionnaire on the survey of learning styles. The sample was made up of students who were doing different courses at the university including, humanities, social studies, law, art and physical education training, education, natural sciences and medical science.

The mean scores of the learning style preference was divided into categorized into three categories. The mean score of 13.5 and above indicates major learning style preference, 11.50 to 13.49 shows minor learning style preference. While 11.49 or less is indicative of negligible learning style preference. The auditory style, visual and individual learning styles were the most preferred learning styles in Lee and Kim's (2014) study. The tactile, kinesthetic and group learning were least preferred learning styles by the students. The researchers used more than two instruments to validate their findings citing Dörnyei (2005) that the learning styles instruments were developed for practical rather than research purposes. Dörnyei (2005) continued to suggest that there is a need to fine tune

the instruments for scientific purposes. Then Lee and Kim (2014) used more than two instruments to validate the findings and results of the study.

The study used the instrument that developed by Reids (1995) for the questionnaire, namely, Perceptual Learning Styles Preference Questionnaire (PLSPQ). The other instruments that were used were, Oxford's (1993) instrument Style Analysis Survey (SAS), Cohen, Oxford and Chris (2001) that is, the Learning Styles Survey (LSS) and Lehrman and Leaver's (2003) Construct. These instruments are set to validate the outcomes of the study.

The PLSPQ used the Likert scale for measurement based on five measure of 1 - 5; strongly agree = 5; agree = 4; undecided = 3; disagree = 2 and strongly disagree = 1. Academic performance of the respondents was observed using the scores for the examination results and term scores. The study used two semesters for data collection. The study was quantitative and used descriptive analysis; t-test; one way ANOVA and Pearson's correlation coefficient in factor analysis. A recent study by Rani (2016) investigated the relationship of perceptual learning styles and academic achievement amongst high school student in India. The sample consisted of 328 high school students, who were studying in various high schools in the Kanyakuri District in India. The purpose of the study was to highlight the need to recognize different modes of learning by the educators and adopt different approaches to teaching. The instrument used, the Learning Style Scales (LSS), was developed by the researcher. The researcher had five hypotheses which were based on the non-significance of perceptual learning styles on:

- a. gender dimension of such as visual, auditory, and kinesthetic learning styles;
- b. academic achievement with respect to gender;
- c. medium of instruction in the dimensions of visual, auditory and kinesthetic learning styles in vernacular (Tamil);
- d. with respect to medium of instruction in English; and
- e. the variables to academic achievement.

The results were:-

Hypothesis one was rejected because female students showed more perceptual learning styles than males as females were more in number than males. The t- values were

greater at the table value of 1.97 at 0.05. In hypothesis two, females showed more academic achievement than males. The t- value was greater than the table value of 1.97 at 0.01. The medium of instruction hypothesis was rejected. It was significant for all the students. Visual, auditory, kinesthetic learning styles and academic achievement had a positive high correlation. The study showed that learning styles have an impact on how students learn and that the educators are to be cognizant of that effect. Individuals have different ways of processing information so that the learner or student may be able to understand and apply it. There are persons who are considered slow learners perhaps they process the information at different pace than others (Abidin, et al., 2011; Rani, 2016). Learning also depends on the information that is already learned and the process of trying to link the new information with the old. This results in learning styles which are different in individuals as it has been alluded to by the above researchers. Learning styles are to be identified by educators as suggested (Dunn, et al., 2010; Schunk, 2012; Rani, 2016).

A case study by Arsyd (2018) on students' learning styles in Bengkulu Province, Indonesia conducted using a sample of 259 senior high school students. The target population was composed of six regencies (regions or provinces). From each regency, one high school was chosen and only one class was selected. The students were chosen by using purposeful sampling technique. The study used a set of questionnaires of (a) one set to classify their learning styles preferences (b) a set designed to identify their perceptions on the already designed and developed English learning materials. There were open-ended questions for qualitative and closed questions for quantitative approach. The participants were given a set of English learning materials which matched their learning styles. The study was based on learning English as a subject and how the students preferred to be taught the subject on the different learning styles, example, visual learning, auditory and kinesthetic learning styles. The results of the data analysis showed that visual learning style was preferred by the majority of the students ( $n=164 = 63.3\%$ ). This was followed by auditory and kinesthetic learning styles at 25.9% and 19.8%, respectively.

To the open-ended questions the response was that they responded to learning activities which suited their learning styles as using pictures and texts. The students preferred using pictures in the improvement of their learning English. The conclusion was that visual learning style was the most preferred style with the additional material like DVD's and CD's. Abidin et al. (2011) investigated the effects of learning styles on academic achievement among students in Malaysian educational system using a sample of 317 secondary school students. The background of the students was Muslim in an Islamic school and speaks Malay Language which is different from the Arabic which is their medium of instruction. The Islamic religion also inculcates a very strict discipline among its followers inclusive of the children. This creates a different environment which is different from the Western civilization. The norms and culture are different and the Arabic literature has different characters of writing compared to the English. The purpose of the study was to identify and profile the learning styles of the learners. The researchers also wanted to measure the attitudes and beliefs of the students. The instrument for data collection was Learning Styles Survey, based on Reid's Perceptual Learning Styles Preference Questionnaire (1987).



Multiple regression and one-way ANOVA were used for data analysis. The results showed that there was significant relationship between academic performance and learning styles. The students carried a workload of 21 subjects at 35 minutes per slot lesson. Even though the workload was this high, the students were doing well academically. The results of the study supported the findings of previous researchers on learning styles their relationship to academic achievement. Although some studies indicated that visual learning styles are preferred than auditory learning styles, others showed that auditory learning is significantly related to academic achievement (Abidin, et al., 2011; Arsyad, 2018). These studies show the importance of learning styles in the process of learning, so educators need to be aware of this aspect. The environment of a learner has an influence on the way the student learns.

#### **2.8.4 Learning Styles and the South African Perspective**

In their recent study, Bosman and Schulze (2018) investigated the preferred learning styles and Mathematics academic achievement among secondary students in the North



West Province of South Africa. The study was quantitative in approach with a sample of 240 learners. The study was based on the following questions.

- a. Is there a significant inter-relationship between academic achievement in Mathematics and learning styles of a group of secondary school learners?
- b. Is there a significant difference between the learning styles of the top and low achieving learners in Mathematics?

The school had multi-cultural type of learners from the different parts of Southern Africa, namely, South Africa, Botswana, Malawi and Zimbabwe. Mathematics was being investigated because of poor performance year end results among the students. The study was exploratory in approach using mixed method with questionnaire for quantitative and open-ended questions for qualitative. The questionnaire was first piloted on 20 students on different grades for the purposes of making sure that students understood the questions. Cronbach's alpha coefficient, which is a measure of internal consistency, was used for reliability. All the correlation coefficient measurements were 0.7 and above, thus indicating that this was a reliable tool. The learners were divided into two groups, that is, high achievers with 75% to 100% in Mathematics and low achievers with 50% and below. The investigators found a significant but small association between individual learning styles and mathematics performance ( $r = 0.16$ ). Although this association was low, it was the highest compared to the rest of the variables (Auditory, visual, kinesthetic, reading, writing and group learning styles), which were non-significant in relation to mathematic performance relationship.

The qualitative approach was more of an in-depth investigation of learning styles with the open-ended questions. The questions were based on the two hypotheses which were on the preference of the type of learning styles. The response was similar to the quantitative approach in that auditory and visual learning styles were preferred and that the high achievers maintained their preferences. Even though the low achievers preferred group-learning styles in the long run, they were able to learn on their own after group interaction. They also revealed that some teachers are not supportive. Two outstanding responses by both male and female learners were:

**Male:** *'I am scared to ask questions as the teacher's responds by saying, 'I don't want to explain that again.'*

**Female:** *'The Mathematics teacher makes the learner feel dumb.'*

The learners who were auditory learners were frustrated by the response and poor explanation of the educators.

The conclusion of the study was that individual learning styles by high achievers was more correlated with achievement for better performance in Mathematics. Individual learning style promotes self-confidence and that the learner can be able to be self-regulating and plan. Group learners who are low achievers benefit if they are guided by a knowledgeable teacher or one of their peers in the group study. An educator is, therefore, supposed to use different models of teaching methods.

The study is very recent and covers both the quantitative and qualitative approach. It is also inclusive of the multi-cultural society of South Africa. It is representative of the rural and urban areas as it is in the setting of the North West Province of South Africa. On the other hand, there are some researchers who disagree with the concept of learning styles. The argument is based on the premises that learning styles cannot be measured properly because of the type of instruments that are not reliable. Dembo (2007) and Reiner (2010) argue that learning styles are a myth and put forward the following suggestions that (a) learning styles instruments are not valid and not reliable (b) and raised the following questions: do learners benefit when the instructions is according to their learning styles? (c) Is there any evidence that, if a learners understands his learning styles, it will improve concentration, memory, self-confidence, reduce anxiety for examinations and promote better academic performance. They also suggest that instruments to measure the learning styles are not valid and reliable because each instrument is based and developed on the theoretical framework by many theories on learning styles. The instruments tend to measure attributes, traits, characteristics or preferences. Dembo (2007), Reiner (2010) and Willingham (2017) argue further that Coffield's instrument cannot be reliable in matching a learner with an educator because of its validity, reliability and application.

Abidin et al. (2011:34) in support of the learning styles argue that,

*'Most students favor to learn in particular ways with each style of learning contributing to the success in retaining what they have learnt. As such, studies carried out conclude that students retain 10% of what they read, 26% of what they hear, 30% of what they see, 50% of what they see and hear, 70% of what they say, and 90% of what they say as they do something (Chuah Chong-Cheng 1988). These facts reveal that each learning style has its own strengths and weaknesses. Some students learn in many ways, while others might only favor one or two. Those students with multiple learning styles tend to gain more and obtain higher scores compared to those who rely solely on one style (Dunn, Beaudry & Klavas 1989). Additionally, the differences in learning styles have also been reported between gifted and the underachievers; between the learning disabled and average achievers; among different types of special education students; and among secondary students in comprehensive schools and their counterparts in vocational education and industrial arts (Dunn & Dunn 1986). Some special students favor kinesthetic instruction, such as experiential, active and hands-on, while many others are more auditory and visually oriented (Dunn 1991).'*

Bosman and Schulze (2018) strengthen the argument made by Abidin et al. in that learners can have more than one learning style which promotes the better academic achievement. Learning is a process that involves the transferring of skills and information to an individual. The educator or instructor needs to be aware of the factors that will inhibit or have positive contribution to the process. The identification of learning styles becomes useful for the process to be effective.



## **2.9 Theoretical Framework**

The learning process is barraged with diverse types of theories which try to identify the effective approach in learning. Since the human mind is a very complicated organ which is the central control of the human behavior and attitude, it is important to study and research on it. It is the central processor of thoughts and actions that are to be taken from the 'central bank' of information. It is within this understanding that in the investigations, that researchers and theorists embark on and coming up with many ideas to try and understand the process of learning (Kolb, 2005; Schunk, 2012). It is admitted and concluded that learning involves the acquiring of skills, which can modify an individual's ways of behavior, attitudes and belief system (Bandura, 1994; Busato, 2000; Kolb, 2005; Schunk, 2012). Learning cannot be only confined to cognitive skills. It also affects motor sensory (reflex action) skills. For example, when one is trained as a soldier, one uses such skills in self-defense. This falls under the theory of behaviorism. The skills

can be for a short-term period or a lifetime. Learning is therefore complex as mentioned before because one deals with a human being who has pre-learned ideas which are used as a frame of reference. This frame of reference may at times not be related to the lesson being learned or the skills being acquired. The use of language that is precise and relevant to the process of learning is also to be taken into consideration (Al-Zube, 2013).

Schunk (2012) asserts that learning has different theories which are applied to different categories. He also cites that (a) behaviorism (b) constructivism and (c) cognitive theories, to name the few which are relevant to this study, because learning and learning styles are based on all the above theories.

### 2.9.1 Behaviorism

The proponents of the theory of behaviorism are, among others were, J. B. Watson and B. F. Skinner. Watson (1958) in behaviorism proposed that an organism receives stimuli and the response in which an act that is followed by a reward is likely to be followed by the same reaction. This is also related to Pavlov and Skinner's operant behavior.

Skinner is the proponent of **Classical and Operant Conditioning** and defines it thus:

- (i) **Classical Conditioning** is the learning that is associated with a new stimulus-response or reflection; while
- (ii) **Operant Conditioning** is the consequence of behavior, that is, a response in the presence of a stimulus reinforcing the previous response. Skinner defines behavior as what an organism does or is doing and what is observed by another organism is doing. To put it simpler, it is the expected reaction to a specific stimulus (Schunk, 2012).
- (iii) **Bandura** defines behavior as '*the effect in the case, and the cause in the latter*' (Bandura, 1977:866). He goes on to expand on behavior as a result of an external stimulus which impacts on an individual. This is registered in the mind and whenever that type of stimulus is repeated, the mind retrieves it in the long-term memory and the short-term memory or working memory is activated for action to be taken.

## 2.9.2 Constructivism

Constructionism is based on Piaget, Dewey and Vygotsky that learners construct knowledge themselves. Constructivists assert that knowledge is not from outside the person or learner but the person constructs that knowledge from within. This is closely related to assimilation, that is, not changed by the knowledge but create its own knowledge.

## 2.9.3 Cognitive theories

Cognitive theories 'stress the acquisition of knowledge and internal structures..... focus on the conceptualization of students' learning process and address the issue of how information is received, organized, stored and retrieved by the mind.' Schunk (2012:23).

The above theories give a background as to how the mind is working and the impact of the stimuli or information on the learner. It is an intricate process which happens at a short space of time. An educator may not be aware of it and conclude that the learners are not willing to understand the lesson, but a psychologist may have a different conclusion. It is therefore vital to understand the learning styles and study habits of learners to have an effective process of learning.



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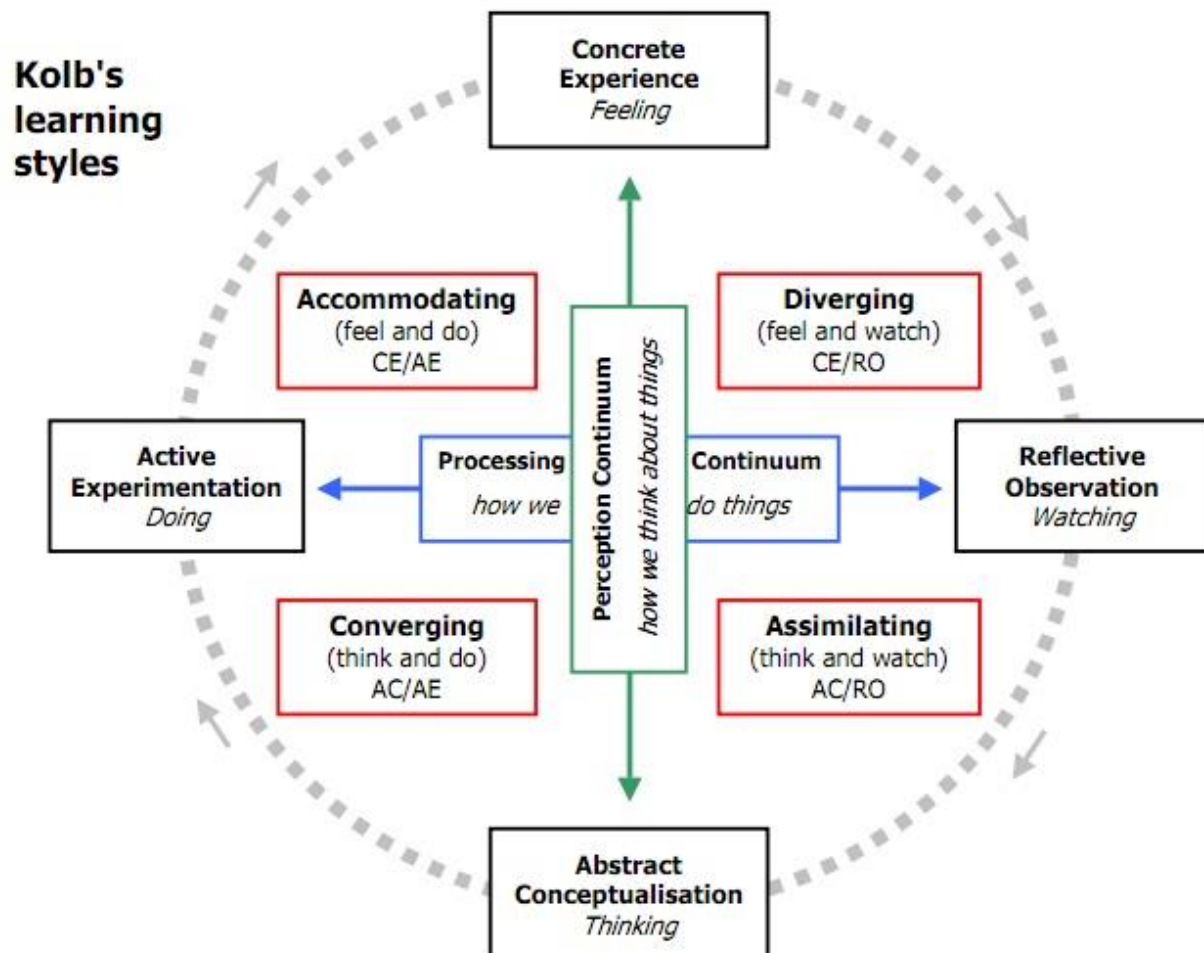
This study was guided by Kolb's theory of learning styles and Covey on study habits. Additionally, Vermunt (2005), as a proponent of learning styles, was used to give more understanding of the learning process, especially on cognitive theory. He asserts that cognitive processing strategies relate to learning new information through thinking strategies which are:

- (a) Deep processing strategy, which is the process of referencing the new information to the old and structure it to be able to interpret or understand;
- (b) Learning activity is to analyze the new information or putting it in the right perspective that is understandable. Thereafter, rehearse and memorize or store it for future use and application;
- (c) Concretizing strategy refers to the evaluation and assimilation. This results into changing the behavior and the demeanor of the learner becoming knowledgeable (Rocha, 2011).

### 2.9.3 Kolb's Theory of Learning Styles

Kolb's theory of learning styles is based on four dimensions which are: - (a) feeling or sensing. The theory asserts that participation in a project or lesson is important. For learning to be effective,, learners must feel and sense what they are learning; (b) watching (reflective observation) that is, the instructor is to be a mentor and guide; (c) thinking (abstract conceptualization) that is, learners are to be given exercises where they use their imagination and thinking and (d) doing (active experimentation) that is, learner to be allowed touch or do the project themselves.

A diagrammatic outline (model) of the Kolb's theory (2005) gives a simple but concise picture of his ideas. This is presented in Figure 2.3



© concept david kolb, adaptation and design alan chapman 2005-06, based on [Kolb's learning styles](#), 1984  
Not to be sold or published. More free online training resources are at [www.businessballs.com](http://www.businessballs.com). Sole risk with user.

Figure 2.6: David Kolb's diagram of Learning Styles

Kolb (2005), as a proponent of learning styles, guided the study in the four dimensions which are the basic concepts of his theory as above-mentioned. The above concepts helped the researcher to identify learning styles of the learner, and the learner is able to be assertive and find learning interesting.

Learners are individuals with different ways of understanding the information that is exposed to them. Kolb (2005) asserts that educators are to be mindful of the different dimensions of learning styles of learning. This can also impede the process of learning, and some students will be left behind. This, in turn, may affect the academic performance of learners. It is, therefore, relevant to use the learning styles as one of the variables to identify whether there is a correlation in academic performance among learners in Mathematical Literacy.

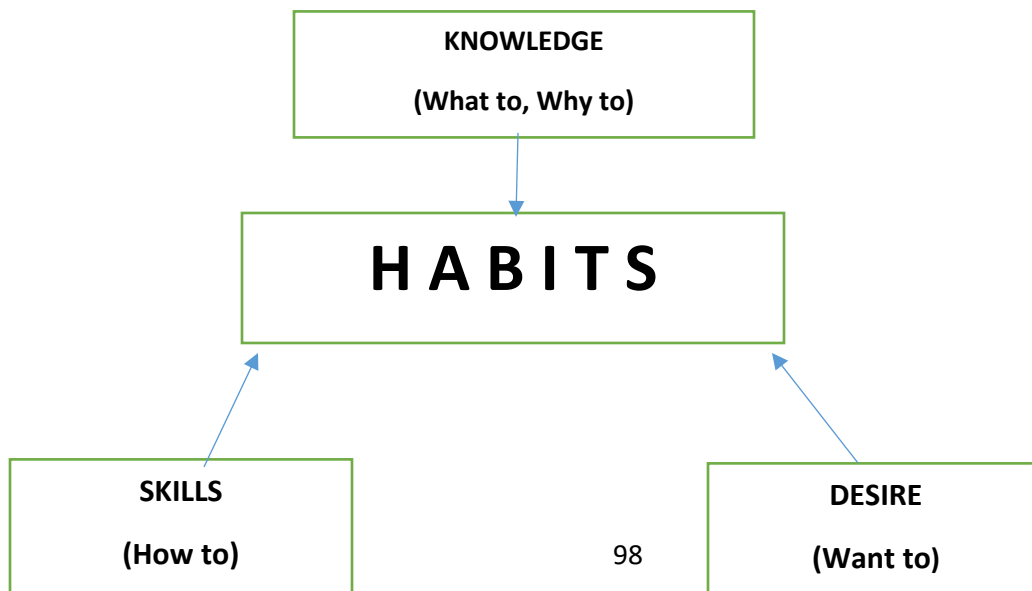
#### 2.9.4 Covey's Theory of Habits

Covey (2004), the proponent of habits, has a model on habits and composed of the following:

- (a) Knowledge;
- (b) Skills; and
- (c) Desire.



Presented in Figure 2.7 is a model by Covey which depicts how knowledge, skills and desire are connected to the study habits.



**Figure 2.7: Initialized principles and patterns of behavior. Source: Covey (2004)**

Habits form the center or the hub of the theory of study habits. Studying needs the focusing of thoughts, feelings and actions. Based on the desire to acquire knowledge and skills, there should be self-regulation, which is an enabling factor to achieve the desired goal of better academic achievement. Academic achievement is not the only benefit that the learner gets in study habits but also satisfaction that is felt after achieving a goal (Bandura, 1994; Covey, 2004).

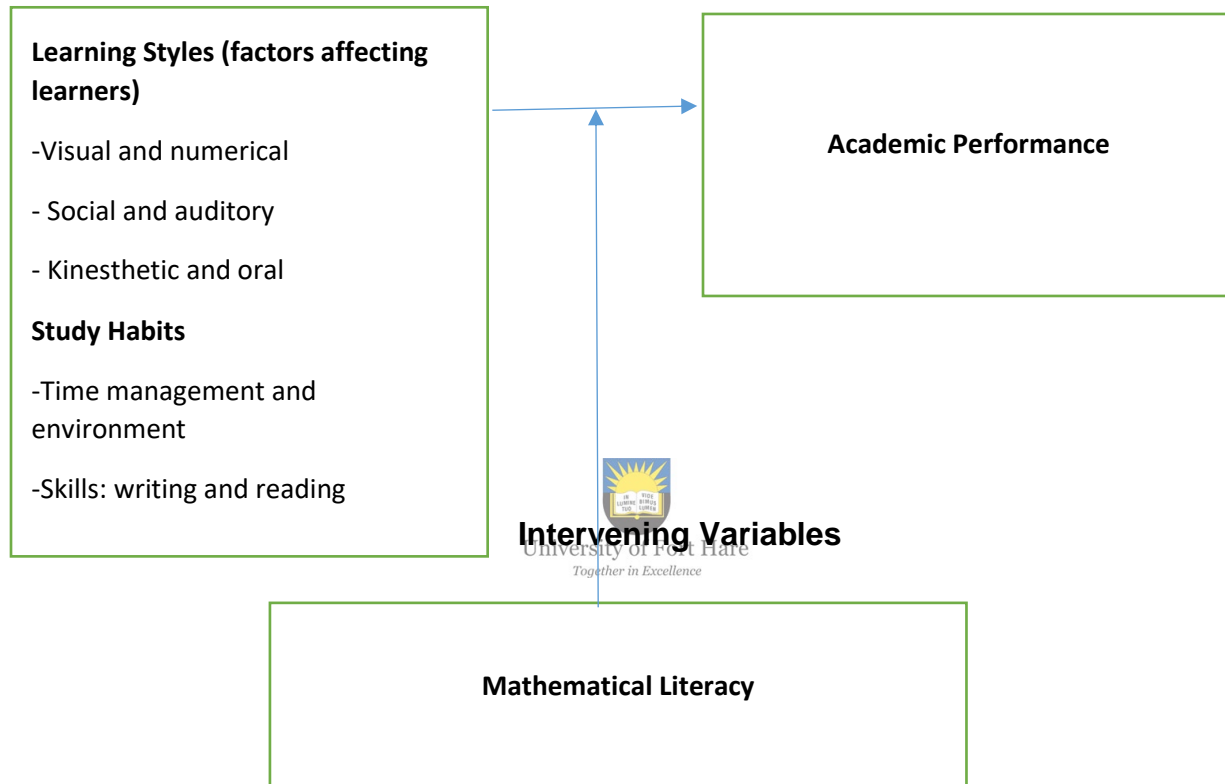
The satisfaction brought about by the capability of doing a task and achieving it brings in self-efficacy. Self-efficacy in study habits brings in a mode of excellence and competence. It is important for educators to recognize the habits of the learners in order to improve the quality of education and academic performance (Choudhury, 2012). Techniques and methods of study develop as the learner continues to study (Lawrence, 2014). It is also important for learners to be encouraged to read and learn even though they may not feel like doing it because helps to create the habit of studying. Additionally, learners are to identify subjects that are both easy and difficult to learn to plan and manage their time effectively (Lawrence, 2014; Magno, 2010). Academic achievement is the end product of study habits initiated by the learner in the process of time management, motivation and skills to acquire good knowledge. Study habits therefore were deemed appropriate to be used as the relevant factors in this study.

A conceptual framework for the study adapted from a similar study conducted in Kenya high school students was used to give a schematic approach on the study to show the relationship of the variables.



## Independent Variables

## Dependent Variables



**Figure 2.8: Conceptual Framework showing Factors influencing Academic Performance among high school students in the Amatole Education District.**

The above model shows the relationship of the variables discussed in the study and their relationship to each other. Mathematical Literacy is deemed an intervening variable because of the assumption that Mathematics and Mathematical Literacy are regarded as difficult subjects. The latter is used as an intervention in the improvement of poor academic performance so that the learners can have a mathematical content.

## 2.10 Summary or Conclusion

The literature review of the study helps to give an idea about the topic of the research and the contributors to the topic. The researcher is then able to look at the areas of interest and those have not been addressed in the topic and identify the relevant theories and definitions of the keywords for the study. The purpose of the study was to investigate the learning styles and study habits as correlates of Grade Eleven (11) students' academic performance in Mathematical Literacy of the Amatole Education District in the Eastern Cape. The education system is impacted by many factors within the learning environment. The learning process becomes complex because of some of the factors that affect it. Some researchers argue that it is very difficult to get a universal definition of learning process because of the concepts and theories that the researchers and practitioners come up with.

The background of the students' academic performance gives a bird's eye view to the challenges of the learners which is inclusive of the academic performance in the lower levels and higher education which is tertiary. It also looks at the economic implications, financial challenges on both the government and communities, and the inadequacy of entry requirements of learners to get to the higher education level. It does not only end in the problem of the entry requirements; students take a longer period to finish their undergraduate studies which also affect the government and the communities that sponsor students. The review of the concepts on learning styles and study habits, as discussed by some of the theorists and researchers, give an idea as to how the learning takes place. It also shows how learning styles and study habits are related to the academic performance and how the learning styles and study habits are affected by self-esteem, self-efficacy, environmental and social support. The study looked at the correlation of lesson content on the styles of learning, the background of the learner and the personality differences because humans have different characters, attitudes, behavior and personalities. Academic performance and study habits in Mathematical Literacy and other subjects were taken into consideration regarding how the learner studies the different subjects like, biology, history, geography and the others.

The relationship of the educator and the learner in the classroom is important because the learner and the educator spend most of their time in the classroom or school. The analogy of a workshop or theatre was used to give an idea as to how the educator shapes the life of a learner in the classroom. Educators use different approaches in the process of educating learners. The most popular method is the pedagogical approach meant for the young children. The youngsters need to be led by the teacher since the teacher is the source of information. It is a teacher centered approach, unlike the andragogy which is a learner centered approach used for adult learners. Since the learning process has various definitions and different approaches which overlap each other, it is therefore necessary to continue research on the different variables that affect academic performance. In the theoretical framework, Kolb's was used for learning styles because the theory addresses different perspective which some researchers and practitioners overlook. It is also inclusive of the different sectors, for example, how young learners and adults learn. It is inclusive of the pedagogical and andragogic approach. The theory of Covey on study habits was also used because of its relevance to the study. It complements the learning styles in that it addresses the desire to know and the acquiring of skills which is assimilation addressed by Kolb.



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## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

The purpose of the study was to investigate whether there was a correlation between study habits and learning styles with academic performance in Mathematical Literacy among the grade eleven (11) high school students. In this chapter of research methodology, the discussion is based on showing the approach and structure that was followed in the study. It is meant to indicate the reasons that led to the specific methods that were deemed necessary and also identify relevant objects and participants in the study. The nature of the research problem that identified and the method of collecting analyzed data determined the research methodology that was followed (Creswell, 2014).

In order to make sense, the research methodology must have plans and assumptions based on the literature review. These assumptions are guided by worldview of theories in which the study is based (Creswell, 2014). The research paradigm and approach are used as a blueprint for the study. Hence, these have to be the guiding instruments in identifying the study design, population, sample and sampling technique, data collection and data analysis.

#### 3.2 Research Paradigm

The study followed the positivistic paradigm, which is more appropriate for this type of study. The positivistic paradigm enabled the researcher to discretely identify the variables and the set of ideas that have an impact on the phenomenon being under scrutiny. The use of the positivistic paradigm enabled the researcher to determine whether there was a correlation of variables with academic performance (Creswell, 2014; Okeke, 2015; Krauss, 2005).

According to Huitt (2011), a *paradigm* is the 'construct of one's reality', the whole system of thinking. It is a set of constructed ideas and perceptions as to how the world works based on scientific observations which are objective. This also involves human interaction

with his/her world as a result of the environment. The environment is a tangible, visible and invisible impact on humanity. These can be psychosocial, physiological, socioeconomic statuses, perceptions and society at large that also impact on humanity. An objective research approach is able to analyze the behavior or interaction of humanity to quantify it (Huitt, 2011).

Quantitative studies follow either a post-positivistic or positivistic paradigm worldview. 'Post-positivists hold a deterministic philosophy in which causes probably determine effects or outcomes' (Creswell, 2014:7). A Post-positivistic paradigm is reductionist in approach in that the phenomenon of interest is broken into a 'small discrete set of ideas' to enable the testing of the variables in research questions. The researcher is objectively involved in the data collection through using a questionnaire.

Krauss (2005) asserts that a researcher using quantitative approach separates him/herself from the world he is studying, based on a scientific notion of cause and effect. The data is measured numerically and provides objectivity (Creswell, 2014).

Table 3.1 below presents a summary of the three major paradigms showing their respective ontological, epistemological, axiological, and methodological philosophical assumptions.



**Table 3.2: Major research paradigms and their philosophical assumptions**

<b>Descriptive</b>	<b>Positivism</b>	<b>Post-Positivism</b>	<b>Interpretivist</b>	<b>Critical Theory</b>	<b>Pragmatism</b>
<b>Synonym</b>	<b>Verify</b>	<b>Predict</b>	<b>Understand / Interpret</b>	<b>Emancipate</b>	<b>Dialectic</b>
<b>Ontology What is real?</b>	Objectivist, findings are the whole truth, which is realism	Modified objectivist, findings are probably true, and there is transcendental realism	Local, relative, co-constructed realities. There is subjective, objectivity and realism	Historical/virtual realism shaped by outside forces, material subjectivity	Constructed based on the world we live in and explanations that produce the best desired outcomes

<b>Epistemology</b> <b>What is true?</b>	The only knowledge is scientific knowledge- which is truth, reality is apprehensible	Findings approximate truth, reality is never fully apprehended	Co-created multiple realities and truths	Findings are based on values and local examples of truth	Objective and subjective points of view
<b>Axiology</b> <b>What is the role of values?</b>	Value- free, propositional knowing about the world is an end in itself, is intrinsically valuable.	propositional knowing about the world is an end in itself, is intrinsically valuable.	Value-laden, and biased. Propositional, Transactional knowing is Instrumentally valuable as a	Propositional, transactional knowing is instrumentally valuable to social emancipation,	Multiple stances, e.g. researchers include both biased and unbiased perspectives.
<b>Methodology</b> <b>How do I examine what is real?</b>	Quantitative - Primarily Experimental, Quasi-Experimental	Usually Quantitative - Experimental with threats to validity. Qual- a case study	Means to social emancipation. Often Qualitative and/or Quantitative	Which is an end in itself, is intrinsically valuable. Usually Qualitative, but also Quantitative	Quantitative & Qualitative Together (Mixed Methods Approach)

Source: (Creswell, 2014: 80)

At this point, it will be important to give a detailed explanation of each of the philosophical assumptions that inform a research paradigm.

### *Ontology*

Ontology refers to the claims and assumptions that people make about the nature of social reality, claims about what exists, what it looks like, what units make it up and how these units interact with each other (Adams, 2014). In other words, ontology refers to people's understandings of the entities they encounter, including the meanings of those entities (Cameron, 2011). This means ontology is all about the nature of the world around

us. As a philosophical assumption, ontology addresses the question: What constitutes reality and how can we understand its existence? Within pragmatism, a particular ontological position was chosen, and this is realism. This view holds that the world comprises objectively given objects and structures independent of the researcher (Ormston, Spencer, Barnard & Snape, 2014).

### *Epistemology*

Epistemology is defined as responding to the question of what is (or should be) regarded as acceptable knowledge in a discipline (Bryman & Bell, 2011) and is also concerned with how knowledge can be created, acquired and communicated to other human beings (Cohen, Manion & Morrison, 2011). In other words, epistemology is all about, what it means to know. It should be noted that the kind of epistemological assumptions a researcher makes or holds about knowledge profoundly affect how they will go about uncovering knowledge of social behaviour (Al-Saadi, 2014).



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### *Axiology*

Axiology refers to the analysis of values to better understand their meanings, physiognomies, origin, acceptance as true, as well as their influence on people's daily experiences (Creswell, 2014). It is a branch of philosophy that studies judgment about value. In other words, it is all about the role of values in research. Researchers demonstrate axiological skill by being able to articulate their values as a basis for making judgments about what research they are conducting and how they go about doing it (Aliyu et al., 2014). The seminal axiological question is: 'What is the ultimate purpose of the inquiry?'

### *Methodology*

Methodology is concerned with strategy or plan of action, which lies behind the choice, and use of particular methods. It addresses the why, what, from where, when and how data is collected and analyzed (Scotland, 2012). The important question of a methodology is: 'How can a researcher discover whatever he/she believes can be known?'

The following section gives a brief outline of two major research paradigms, describing their principles and explaining the ontological, epistemological, axiological, and methodological positions of each.

### 3.3 Research Approach

The research approach for the study was quantitative as it relates to the paradigm that guided the study. The researcher defined the problem using the quantitative approach, selected the concepts on which to focus and designed the study according to the concepts. Data was collected using a questionnaire based on Kolb's Learning Styles Inventory (2005) and (Bosman, 2018).

The researcher deemed this approach appropriate because it generated information on the relationships among study habits, learning styles, teaching process and academic performance in Mathematical Literacy. The quantitative approach was regarded to be a more objective approach since it dealt mostly with figures and did not deal with perceptions, compared to the qualitative approach (Joubert, et al., 2007).



The questionnaire consisted of three sections: biographical, the study habits and the learning styles sections. The first section was Section 1 and required the respondents to provide biographical details which were age, gender, nationality and grade. This was followed by the second part which sought information on the locality of the school (either urban or rural). The third part was on whether the learner was a boarder or day scholar. The last part was on whether the learner did Mathematics or Mathematical Literacy. The second section was Section 2 which was on study habits and had seven factors: time management, study environment, test taking and preparation skills for the test, note taking skills, reading skills, writing skills and Mathematics or Mathematical Literacy skills. The Likert scale was used for measuring the factors using four points which were rarely; sometimes; generally and always (rarely = 1; sometimes = 2; generally = 3 and always = 4). The last section which was Section 3 was on learning styles with factors of visual language, visual-numerical, social-individual, social-group, auditory-language, auditory-numerical, auditory-visual-kinesthetic, expressiveness-oral and expressiveness-written.



The same measurement and scale used in the study habits also applied in the learning styles. The data collected from the response of the participants was captured and analyzed using the software for data analysis, SPSS Version 17 (Creswell, 2014; Polit, 2012).

### **3.4 Research Design**

The researcher had to use a design that defined and explained how objects and subjects interact with each other within the world. The researcher explained phenomena using world views. There must be (a) a starting point for collecting the information (b) observation, that is, what is involved in the process; and (c) the analysis of information, findings and comments on the results of the study (Okeke, 2015). The researcher may have to deal with living and non-living or animate or inanimate subjects or objects. This means that one has to design a specific approach after reviewing literature on other researchers on the phenomenon. The researcher identified the cause and effect of the phenomena giving rise to the variables that affect it. A research design is an overall plan to obtain answers to the questions or hypotheses that are being framed. It serves as an architectural backbone of the study based on the theoretical framework (Polit, 2012; Creswell, 2014). The components of the study are put together in the research design so that they form researchable questions.

A research design must be clear and precise. It must be able to show where the data will be collected, how the data is to be collected and identify the population and analysis, i.e. what software will be used in analyzing data (Polit, 2012).

Research design can reflect the purpose of inquiry which are as following, namely, (a) exploratory (b) descriptive (c) explanatory (d) predictive (e) evaluative and (f) historical.

- (a) Exploratory – factors that are related to the variables that are under scrutiny. It is also where nothing or little is known about the issues to be researched (Ary, et al., 2014; Okeke, 2015);
- (b) Descriptive – this looks at characteristics, the prevalence and occurrence of the phenomenon (is there a correlation of the variables?);
- (c) Explanatory – looks at factors that cause the phenomenon (can the phenomenon be explained by experimental, observation and measurement);

- (d) Predictive – it looks at the expected reaction when the situation is altered (if phenomenon A occurs phenomenon B occurs);
- (e) Evaluative - evaluative looks at how effectively a program is working. For example, has Mathematical Literacy improved academic performance among learners as an intervening subject (variable) for Mathematics?
- (f) Historical – looks at the past events as to whether they have an impact on the variable scrutiny (Polit, 2012).

The design of the study was descriptive correlational to identify whether there is a connection or association between the variables. This design was selected because the investigator sought to determine whether there was a relationship among study habits, learning styles and academic performance in Mathematics Literacy. The study used the quantitative research design method to determine the demographic data variables of interest and their relationships.

### **3.5 Population, Sample and Sampling Techniques**

#### **3.5.1 Target Population**



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The study was conducted in South Africa, and the target population was identified from the nine provinces, namely, Eastern Cape, Gauteng, Limpopo, Mpumalanga, KwaZulu Natal, Northern Cape, Free State, North West and Western Cape. Due to limited resources and financial implications to conduct such a big study, the target population was narrowed down from a national to a provincial representation. The province was also narrowed to a region, which is composed of towns. The Eastern Cape was the province in which the study was conducted in the Amatole Education District and the Eastern Region, with a population of 6,486 Grade 11 learners.

The target population was the learners registered in high schools situated in five small towns in a rural area, namely, Idutywa, Butterworth, Nqamakwe, Fort Beaufort and Middledrift. Mdantsane Township in the outskirts of the city of East London represented the urban area. The population was accessible and the researcher did not find it difficult to collect data (Ary, et al., 2014).

The majority of learners in South Africa come from rural areas. This study therefore took a sample in this population. The total population of Grade 11 for the five towns, namely, East London (city), Butterworth, King William's town, Fort Beaufort and Idutywa is approximately 21,086. Four schools were chosen from these five towns representing urban and rural schools to enable comparison.

### **3.5.2 Sample**

A sample is the small part of the population that representing the population that has been identified for the study. Sampling is taken from the objects, that is, inanimate objects that are non-living in explorative design. Animate subjects like humans, for example, students, teachers, professional organizations etc. are all referred to as units of analysis (Bryman, 1995; Ary, et al., 2014; Okeke, 2015). Table 3.1 represents the description and stratification of the population according to area, gender, etc. The actual sample size and the number of participants at the time data collection were determined with the help of a statistician. Statistics and information for the study were obtained during the process of data collection.



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**Table 3.2: Information Provided during Data Collection**

<b>AMATOLE EDUCATION DISTRICT GRADE 11 STUDENTS</b>						
<b>TOWNS/CITIES</b>	<b>SCHOOLS</b>	<b>POPULATION</b>		<b>SAMPLE</b>		<b>Total in Sample</b>
		<b>Female</b>	<b>Male</b>	<b>Female</b>	<b>Male</b>	
<b>East London</b>	Bongolethu	47	49	30	25	55
	SEK Mqhayi	8	19	8	19	27
	Nyameko	74	98	27	7	34
	Mzwini	20	24	12	4	16
<b>Fort Beaufort</b>	Healdtown	15	32	3	14	17
<b>Idutywa</b>	Idutywa School of Excellence	34	45	9	5	14
<b>Middledrift</b>	Kama Senior Secondary	15	25	7	11	18
<b>Butterworth</b>	Ndabankulu	130	119	38	27	65
<b>Nqamakwe</b>	Nomaheya	69	70	10	18	28
	Xilinxá	39	40	24	22	46
	Blythswood	75	68	23	25	48
<b>TOTALS</b>						<b>368</b>

In the sampling process, the researcher selected a portion of the population to represent the entire population. The selected portion was the sample composed of the basic elements from which the data was be collected (Polit, 2012).

Probability sampling was used in this study and included the following types of techniques: stratified, cluster and random sampling. Cluster sampling was used because the learners were already clustered into different towns/cities, schools, classes and grades. Learners who were doing Mathematical Literacy were in different classrooms, separate from those studying Mathematics.

### 3.5.4 Criteria for Inclusion and Exclusion

Participants who were included in the study were in Grade 11; currently enrolled and attending classes; able to read and write English or isiXhosa and any other local or official language. However, participants with mental challenges were excluded from the study because there was no provision of that category. In clustering high schools in East London, model C schools were excluded, since they are well resourced and very different from rural schools. Besides, they only offered Mathematics and not Mathematic Literacy.

### 3.6 Data Collection

The principal investigator collected data with the help of two research assistants recruited who were first trained for the purpose of collecting data. The research assistants had previous experience in data collection in a similar project. Prior to data collection, the principal investigator introduced the study to the principals, teachers and students. This information included study purposes, extent of the students' involvement, confidentiality of the information, benefits and risks of the study and the right to remove themselves from the study at any point. Where there were learners who were under the age of eighteen, each of the learners was given a consent form to give to the parent and read and sign to indicate if they were willing for their child to participate in the study. Students above the age of eighteen willing to participate were not given assent forms to sign because the principals of the schools demanded the letter from the Eastern Cape Department of Education. This was provided because permission to conduct the study by the department was already granted.

Three days later, those students who were willing to participate in the study were requested to remain after the school in order to participate in the study and complete the questionnaires. In some schools where learners had free periods, the researchers were allowed to let the students complete the questionnaires during break. Some educators were willing to help in the completion of questionnaires since some of them were Mathematical Literacy teachers and had an interest in study which was dealing with the subject they were teaching. The principal investigator had to assist the participants in completing questionnaires, making some clarifications where necessary. This was done

without influencing their response to the questionnaires. Learners were reassured about anonymity of their responses to the questionnaires; no one would be able to identify them since they were using the identification code that was derived from their dates of birth.

### **3.6.1 Data Collection Instruments**

The researcher made use of the Study Habits and Learning Styles Questionnaire (SHLSQ). The instrument was adapted from the Virginia Gordon's University Survey: A Guidebook for New Students and Kolb's Learning Styles Inventory. These instruments have a long track record in universities in the United States of America (US) and adapted for use in a South African environment. A few questions were deleted so that they can be user friendly for learners in Grade 11. The statistician had input in the process and the questionnaire was piloted with five high school students who were doing Mathematical Literacy. The study habits section measured time management, environment, test taking and preparation skills, note taking, reading skills, writing skills and Mathematical Literacy skills. The learning styles measured visual language, numerical, auditory language, social, oral expressiveness and written expressiveness.

The Likert scale rating was used for both study habits and learning styles responding with: 1= rarely; 2= sometimes; 3 = generally; and 4 = always. The Mathematics Literacy Achievement Test was tested using the midyear examinations results. This was to measure the performance achievement in Mathematical Literacy to answer some of the questions in the study. High scores in the mid-year examination means good performance and any score below 30% is a fail. To obtain an NSC, a candidate must, depending on the minimum requirements, achieve either 40% or 30% in six subjects. In the seventh subject, a candidate is allowed to achieve less than 30% (Education, 2018:23).

### **3.7 Data Analysis**

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) software for Windows Version 17 (SPSS Inc. Chicago, IL). The significance level was set at  $p\text{-value}=0.05$ . Descriptive statistics of frequency, percentages and mean were used to summarize the entire data. Data was analyzed using inferential statistics of Pearson Product Moment Correlations (PPMC) and t-test. A correlation analysis was

performed to determine the association between location, gender and level of mathematics on academic performance. Additionally, the ordinary least square regression analysis was conducted to test the relationship between the study variables. A t-test was used to determine gender differences across variables.

### **3.8 Reliability and Validity**

The reliability and validity of an instrument determines the accuracy and relevance of the data to be collected. Inaccurate data collection will result in a skewed data analysis and distorted results (Creswell, 2014; Okeke, 2015).

#### **3.8.1 Reliability**

Quantitative research relies on the quality of formation collected during the research process. According to Creswell (2014), information has to be reliable and valid (Polit, 2012; Creswell, 2014) because the scores to items on an instrument should be internally consistent, stable over time (test-retest correlations) or whether there should be consistency in test administration and scoring (Creswell, 2014).

Creswell (2014) asserts that the reliability of an instrument for correlation purposes is to be tested, that is, the test-retest with the coding, capturing, interpretation and analysis of data. Since this is costly and time consuming, and was counterproductive for the time frame of the study, it was deemed not necessary because the instruments were standardized and used in different studies that were conducted previously.

**Table 3.2: Table for reliability of the instrument for analysis**

<b>Variables</b>	<b>Number of items</b>	<b>Cronbach's Alpha</b>
Time management	8	0.34
Test taking	8	0.34
Note-taking	7	0.33
Reading skills score	5	0.35
Writing skills	6	0.37
Maths literacy	6	0.48
Visual-language	5	0.30
Visual-numerical	5	0.41
Social-individual	5	0.50
Social-group	5	0.62
Auditory-language	5	0.50
Auditory-numerical	5	0.50
Auditory-visual	5	0.43
Expressiveness-oral	5	0.46
Expressiveness-written	5	0.52
Study Habits	45	0.80
Learning styles	45	0.79



### **Reliability Coefficient of Scales**

The reliability of the instrument was assessed using the Cronbach's alpha coefficient. The analysis was carried out for the whole instrument and for each section separately. The reliability coefficients are presented in the table above. Reliability coefficients greater than 0.70 are considered to be reflective of acceptable reliability. The results above show that when all items are included in the reliability analysis, the instrument is acceptably reliable. Cronbach's Alpha for Study habits and Learning Styles were 0.80 and 0.79, respectively. However, reliability analysis shows that only the social group construct had acceptable reliability.



The instrument was standardized as it had been used in previous studies in the United States of America (USA).

### **3.8.2 Validity**

The instrument used for the study was used in some similar studies at Virginia Gordon University Survey. Construct validity was used to ensure that data collected answers the research questions (Ary, et al., 2014). The statistician helped out in the construction of additional items like academic performance and some of the suggestions which were taken into consideration. The instrument had to be adapted to the situation of the learners in Grade Eleven. The supervisor checked the content and face validity of the instrument and was satisfied.

### **3.9 Ethical Considerations**

Ethics is an important issue when dealing with individuals or subjects like students, professionals and organizations. There are sensitive issues that are not supposed to be revealed either by the media or researcher. People are entitled to their privacy and one can be sued if sensitive information about an organization or persons can be publicized without permission (Okeke, 2015). This means that a researcher had to abide by the code of ethics which regulates research programs. Prior to conducting the study, ethical clearance was obtained from the University of Fort Hare Research Ethics committee, and permission was obtained from relevant stakeholders. Permission to conduct research was granted based on the fact that the researcher was to abide by the letter of intent when the request was made. The letter specified that there would be no unethical conduct that would be practiced.

In research, data can also be collected from people and about people. Researchers are to adhere to ethical considerations to protect participants, develop trust, promote integrity and guard against misconduct and inappropriate use of data (Creswell, 2014). Therefore, important facets of ethics were followed, namely, informed consent, confidentiality, anonymity, avoiding harm to participants and permission.

### **3.9.1 Informed Consent**

The learners were supplied with the consent form before commencement of the study at the different school sites chosen. The researcher shared with participants what the study was about and what it sought to find out. The participants were given an opportunity to express their concerns before the commencement of the study to avoid frustrations of both parties in ensuing processes. Prior to data collection, the researcher requested participants 18 years and above to sign a written consent form. The parents of those below 18 years signed the consent forms, and each student gave her/his assent.

### **3.9.2 Confidentiality**

The researcher assured the participants that no unprofessionalism would exist to access information from them and gave them the assurance that the gathered data will only be used for the purpose of the study. They were reassured of confidentiality and in order to ensure confidentiality, participants were assigned code numbers derived from their dates of birth.



The code that was generated had six digits (Year – 1999: Month – December; Date – 31 was 991231).

### **3.10 Anonymity**

The participants were also informed that information about them and their responses to the questionnaire would not be shared with any person. The keys linking the code numbers to the names were only accessible to the principal investigator.

### **3.11 Avoiding Harm to Participants**

The benefits and risks of this study were explained to the principals of the schools, students and the assistant teachers. There were no anticipated risks or harm in this study because it was not an experiment or students were not subjected to any drug testing or required to perform any physical activity.

Participants were informed that their decision to participate in this study would not affect their grades or studies in any way. They were also informed that they were free to

withdraw from the study at any point if they needed to do so or were uncomfortable with the situation. This meant that, if the learners were to travel a long distance home or will miss their transportation home, was free not to participate.

### **3.12 Permission**

Prior to conducting the study, the principal researcher sought clearance from the Faculty of Research Ethics Committee and Institutional Research Ethics Committee of the University of Fort Hare which was granted. The researcher approached the Department of Education in the Eastern Cape, South Africa to be granted permission to conduct the research in the schools that were identified. The permission was granted. At the sites for research, the researcher also requested for permission from the heads of schools to carry out the study in their respective schools and permission was also granted.

### **3.13 Summary or Conclusion**

This chapter presented the research methodology of the study which maps out the pathway that followed in the research study. It has different steps necessary to be taken into account to make readers to understand what is being studied and analyzed. It must be stated clearly which paradigm will be followed and the reasons for making that decision. The approach and design are stated clearly because they are the blueprint of the study. One can have the approach and design in place, but if the population is not identified, the research study will not be complete and successful. The population is composed of the subjects of analysis. The population may be composed of thousands of subjects, which may pose a problem. It is at this stage where sampling takes place to represent the population with all its characteristics. To collect information from the target population using sampling, the researcher uses an instrument that is reliable and provides valid information about the subjects of analysis. When the data has been collected, it must be analyzed and discussed.

In this study, the above-mentioned procedures were followed. Having used the post-positivistic paradigm, the approach was quantitative and the design was descriptive correlational. The population for the study was grade eleven learners from the Amatole Education District in the Eastern Cape. Sampling probability was used and the technique

was a cluster type because the learners were all offering Mathematics in Grade 11. The instrument used was a closed ended questionnaire based on a Likert scale for measurement. Confidentiality and anonymity were emphasized with informed consent in place. Data were analyzed by a statistician using SPSS software for Windows Version 17. In the next Chapter, the results of the study are presented.



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## CHAPTER FOUR

### DATA PRESENTATION, ANALYSIS AND DISCUSSION OF THE FINDINGS

#### 4.1 Introduction

This chapter focuses on statistical analysis of the data and interpretation of the results. Areas of coverage included first, socio-demographic profile of learners; age, gender, and location of the school. This was followed by determining the relationships between the variable of study habits, learning styles and academic achievement in Mathematical Literacy. The results are presented in the form of Figures and Tables. The results are presented according to the following study hypotheses:

**H<sub>0</sub> 1:** There is no significant relationship between study habits and the academic performance of Grade 11 students in Mathematical Literacy.

**H<sub>0</sub> 2** There is no significant relationship between the learning styles and the academic performance of Grade 11 students in Mathematical Literacy.

**H<sub>0</sub> 3** There is no significant relationship between study habits and academic performance in Mathematics Literacy of Grade 11 students.



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**H<sub>0</sub> 4** There is no significant relationship between learning styles and academic performance in Mathematical Literacy of Grade 11 students.

**H<sub>0</sub> 5** There is no significant relationship between geographic locations of schools and academic performance in Mathematical Literacy of Grade 11 students.

The variables in consideration were study habits and learning styles, which were independent variables. Academic performance was used as a dependent variable. Under the study habits as correlates of academic performance in Mathematical Literacy, the researcher focused on time management; study environment; test taking and preparation skills; note taking skills; reading skills; writing skills and mathematics and or Mathematical Literacy to test correlation.

For learning styles, learners were to respond to whether they are more inclined to visual language; visual numerical; study as an individual (alone); study as a group; be read to

and do calculations, that is, similar to old mental arithmetic; write and rewrite to remember information; oral assignment than written and lastly, written assignment than oral.

The Likert scale rating was used for both study habits and learning styles responding with: 1= rarely; 2= sometimes; 3 = generally; and 4 = always.

## **4.2 SAMPLE DESCRIPTION AND ANALYSIS**

Sample description and analysis gave an understanding of the sample size which is a subset of the target population. It also shows the characteristics and statistics of the sample. These may be represented by tables, figures and charts (Polit, 2012). The sampling of the study was limited to the high schools in the Amatole Education District using the Eastern Region. East London high schools in the Mdantsane Township represented the urban area. Butterworth; King Williamstown; Nqamakwe; Middledrift; Idutywa and Fort Beaufort represented the rural areas. The sample consisted of 368 participants. Initially, four town/cities were targeted but some schools in the targeted towns were phasing out Mathematical Literacy and consequently, there were no Grade 11 students. Two towns were added so as to make up the targeted population. This also added to the 368 participants who were taking Mathematical Literacy.



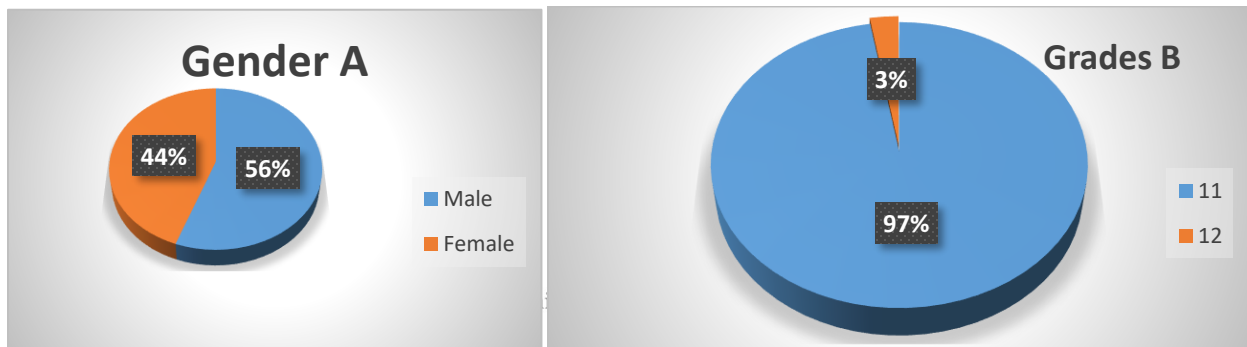
### **4.2.1 DEMOGRAPHIC CHARACTERISTICS**

The demographic results which provide the characteristic trend of the population of participants show the following details. The mean age of the participants was 18.75 (SD±1.9). The age ranged from 15 to 26.

**Table 4.1: Age distribution of the participants**

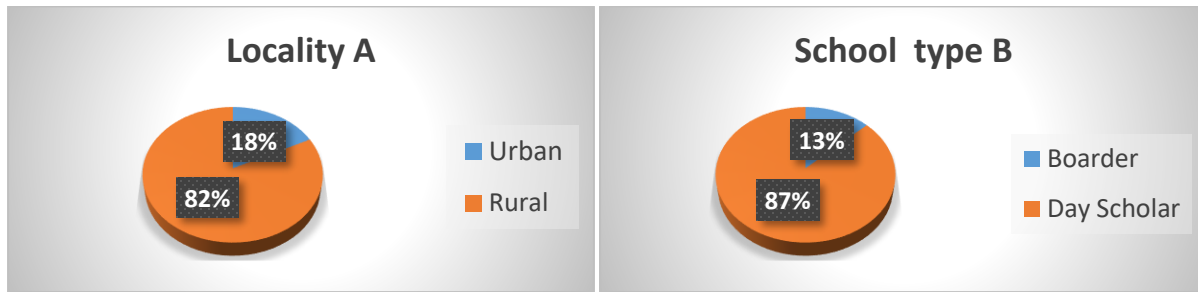
Age (Years)	Frequency (n)	Percentage (%)
15-20	301	82.9
21 and above	62	17.1

The participant age distribution shown in Table 4.1 is between 15 years to 26 years. The 15 to 20 years distribution was 82.9%, which puts them in the majority, and between 21 and 26 the distribution was 17.1%.



**Figure 4.1 A and B: Gender distribution of the learners *and* Grades of the learners**

Figure 4.1.A is representative of gender frequency. The majority (56%) of the students was males and 44% were females. The inclusive population of learners, that is, without specifying the rural from the urban, showed that females are in the minority. On the other hand, when looking at Table 3.1, female learners from the urban areas are in the majority with 59% compared to the male learners. Having the majority of participating males in the rural areas has an underlying factor which could have influenced the results of the study.



**Figure 4.2 A and B: School locality and school type**

Figure 4.2 A represents the location of the schools which the respondents attended. The location of the schools was either the urban or rural area. The urban area is formal, organized and structured into town or city with streets and roads according to the municipality requirements. These requirements are for the purposes of services which include refuse collection, water and sewerage and also firefighting (Statistics, 2004). 'A town, township or city contains 20 000 people or more, or a main place contains 1000 people with a density of 1000 or more people per km<sup>2</sup>' (Statistics, 2004:10). Unlike the urban area, the rural is divided into tribal areas under a headman or a chief with commercial farming which is based on self-subsistence. There are no streets like the urban or any services by the municipalities. In this study, urban schools were represented by the Mdantsane Township high schools, as the high schools in the city of East London offered Mathematics and not Mathematic Literacy. The rural area was represented by more (82%) respondents, and only 18% were from urban schools. The representation may look skewed but the conditions of the township (Mdantsane) is similar to the rural area because of the limited resources and also the Mathematical Literacy is offered as a subject which is one of the variables in the study.

Figure 4.2 B represents the type of schools (boarding or day scholar). Boarding is defined as accommodation in hostels may be in single rooms or dormitories, with shared facilities such as kitchens and bathrooms. It is a form of accommodation for workers, students or scholars. School hostels (boarding houses) are classified as institutions which are more prevalent in the rural areas of the Eastern Cape (Statistics, 2004).

The boarding school is regarded as having a more conducive environment for learning (Zachariah, 2016). The boarding school may not have an effect on the results of the study



since participants from such schools were in the minority (13%). There were more day scholars at 87% and were boarders 13% in the school type.

#### **4.2.2 Descriptive statistics**

The table below shows the statistical results of the sample characteristics. The variables on the study habits that were measured were seven to determine the relationship between study habits and academic performance. The variables are the seven and are as follows: time management; test taking skills; note taking; reading skills; writing skills and mathematical literacy skills. Under the learning styles were: visual-language; visual-numerical; social individual; social group; auditory-language; auditory-numerical; auditory-visual; expressive-oral and expressiveness written. The standard deviation (SD) was from 2.60 to 3.53 was not spread but clustered showing that the scores were homogenous.



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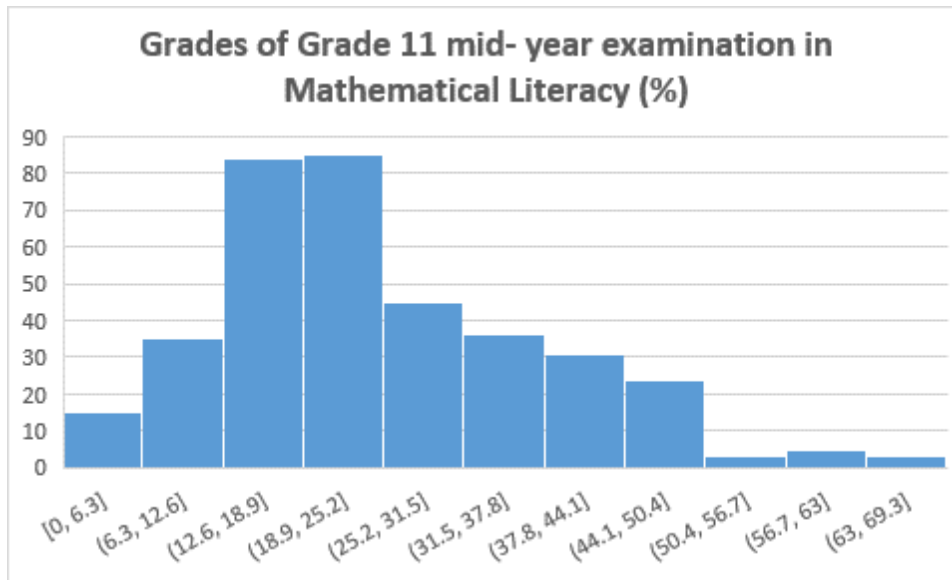
**Table 4.2 Mean scores, range and standard deviation of the scales**

<b>VARIABLES</b>	<b>MINIMUM</b>	<b>MAXIMUM</b>	<b>MEAN</b>	<b>SD</b>
Time management	14.00	32.00	21.96	3.52
Test taking	12.00	31.00	20.90	3.53
Note-taking	10.00	28.00	18.78	3.28
Reading skills score	6.00	20.00	12.05	2.60
Writing skills	9.00	24.00	16.87	2.95
Maths literacy	8.00	24.00	15.07	3.13
Visual-language	7.00	20.00	13.56	2.65
Visual-numerical	6.00	20.00	13.00	2.86
Social-individual	6.00	20.00	14.06	2.93
Social-group	5.00	20.00	13.55	3.25
Auditory-language	6.00	20.00	12.71	2.89
Auditory-numerical	5.00	20.00	13.18	2.85
Auditory-visual	6.00	20.00	13.74	2.85
Expressiveness-oral	5.00	20.00	12.32	2.90
Expressiveness-written	7.00	20.00	14.75	2.87



### **4.3 Academic Performance in Mid-year Examinations**

Academic performance of Grade 11 students in Mathematical Literacy in the mid-year examination was generally poor, with scores ranging from 3% to 68% and a mean of 25 % (SD1.14). The summary is presented in Figure 4.3 below.



**Figure: 4.3 The Graph of Mid-year Mathematical Literacy Scores of Grade 11 Students**

The scores show that 80% of the students scored below 30%, which is the Senior Certificate pass mark. The scores of the majority of the students which is 80%, range from 13% to 25%. The highest achievers scored 69% although they are in the minority of 2%.



#### 4.4 ANALYSIS

The analysis of the data gives meaning to the results and answer questions that were posed as hypotheses. The study investigated the relationship between variables, namely, study habits and learning styles and how they affect the academic performance of the learners after the introduction of Mathematical Literacy. The results of the Pearson's  $r$  which is used as a correlation coefficient for two variables are presented below to identify significant relationship. This will be followed by the results of the Ordinary Least Square Regression.

**Table 4.3: Pearson Correlation statistics showing relationship between study habits constructs and mathematics scores**

<b>Variables</b>	<b>Mathematics scores Significant values</b>
Mathematics scores	1
Time management	0.086
Study environment	0.014
Test taking	-0.031
Note taking	0.114*
Reading skills	0.054
Writing skills	0.158**
Maths literacy	0.165**



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### **Pearson's Correlation Analysis of Performance and Study Habits**

Shown in Table 4.3 of Pearson's Correlation Analysis is the correlation between study habits and academic performance in Mathematical Literacy. The results indicated that there was a significant correlation between study environment and academic performance as follows ( $p \leq 0.014$ ). Test taking skills also had significant correlation with academic performance at ( $p \leq 0.031$ ). The writing skills factor measured English grammar; spelling and punctuation; writing of assignments; creating an outline of an assigned topic for discussion or essay; use of library and internet for research purposes; punctuality in completing an assignment and effective communication in writing. This also forms one of the major factors for study habits because a student who fails to communicate what he/she has been reading does not understand the content of the subject.

There was significant relationship between age and academic performance which was ( $r=-0.207$ ;  $p < 0.001$ ). Age has an impact on academic performance in that the older the person the more experience they have, and this gives them advantage over others. Moreover, younger students may be more focused on their studies, which was the case in this study as they performed better than older ones. Older students perhaps have other responsibilities that distract them that influence their performance.

Time management has to do with study habits. If learners have good study habits, their performance would show a positive relationship, that is, the more the student studies, the better performance he/she shows. The relationship between time management and performance specifically for all the learners without considering gender differences, had no significant relationship. In the current study, no correlation between time management and performance were found, and this was unexpected. The study measured study habits based on gender, location and Mathematics/Mathematical Literacy and their effects on academic performance.

#### **4.5 Research Hypotheses**

The study's hypotheses were verified using results of the data that was collected based on the questions that were structured according to the hypotheses. There were five hypotheses on correlation of study habits and learning styles on academic performance in Mathematical Literacy.

#### **4.6 Hypothesis One – Significant relationship between study habits and performance**

Hypothesis one stated that, “there is no significant relationship between study habits and the academic performance in Mathematical Literacy.”

The hypothesis was tested under the following seven factors using the Likert scale of 1 to 4 for rating, namely:

- a. Time Management
- b. Your Study Environment
- c. Test Taking/Preparation Skills
- d. Note Taking Skills


- e. Reading Skills
- f. Writing Skills
- g. Mathematics/Mathematical Literacy

The time management factor was the first to be measured because it is one of the major factors in study habits since it deals with self-regulation and the ability make use of time, at school and at home. It can also be regarded as an indicator in the process of learning whether a learner has good study habits which are considered to be essential in achieving better academic performance (Cerna, 2015; Govender, 2018). The learners or participants in the study were given questions in the form of a questionnaire to respond. The questions ranged from a learner making his/her own timetable, sticking to it, as to how much time spend more time socializing and reading.

The table below shows responses of participants to the questions and the rating of the responses to the time management factor.

#### 4.6.1 Time Management and Performance

**Table 4. 4: Time management**



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Variables	RARELY	SOMETIMES	GENERALLY	ALWAYS
	n (%)	n (%)	n (%)	n (%)
Do you make your own timetable for each semester?	38 (10.7)	212 (59.9)	20 (5.6)	84 (23.7)
Do you update it weekly daily?	56 (16.2)	173 (50.0)	58 (16.8)	59 (17.1)
Do you stick to it?	47 (13.8)	152 (44.6)	51 (15.0)	91 (26.7)
Do you allow time for exercise and socialising with friends?	22 (6.3)	148 (42.4)	39 (11.2)	140(40.1)
Do you get at least time for exercise and socializing with friends?	24 (6.9)	134 (38.4)	39 (11.2)	152(43.6)
Do you get at least 2 hours of study each day?	28 (8.1)	166 (48.3)	49 (14.2)	101(29.4)

Do you get your assignment done on time?	13 (3.8)	79 (22.8)	38 (11.0)	216(62.4)
Do you regularly attend your class?	4 (1.1)	27 (7.7)	24 (6.9)	294(84.2)

Table 4.4 shows the responses of the participants in the questionnaire. It was expected that their performance academically would be significantly related to performance according to their response. The question on class attendance scored the highest at n=294, 84%, which was the category of the highest rating (4 points). Questions 4, 6 and 7 had the highest rating under “always”, rated at 4 points.

**Table 4.5: Association between socio-demographic characteristics and time management score**

Variables	Frequency (n)	Mean Time management (Hrs.)	SD	p-value
Age (years)				
15-20	237	22.07	3.57	0.382
21 and above	47	21.57	3.33	
Gender				
Male	170	21.91	3.66	0.773
Female	117	22.03	3.32	
Locality				
Urban	46	21.76	3.37	0.662
Rural	236	22.01	3.54	
Student type				
Boarder	39	23.31	3.20	0.009
Day	239	21.73	3.53	

As shown in Table 4.5, only student type was significantly associated with time management scores. Age, gender and school locality were not significantly associated with time management of students.

**Table 4.6: Results of Ordinary least square regression showing relationship between time management scores and academic performance in Maths literacy**

Variable	Unstandardized Coefficient (B)	Standard Error	Standardized coefficient	T	P
Constant	53.01	10.45		5.07	0.000
Age	-1.02	0.43	-0.14	-2.40	0.017
Gender	1.59	1.59	0.06	1.00	0.317
Locality	-9.41	2.10	-0.26	-4.46	0.000
Time management	0.33	0.22	0.09	1.51	0.133
Model adjusted R <sup>2</sup>	0.081				

There was a significant relationship in age and locality of the school and academic performance. After controlling for demographic factors, time management was not significantly associated with academic performance in Mathematical Literacy.



## 4.6.2 Study Environment and Performance

**Table 4.7: Study environment and performance**

<b>VARIABLES</b>	<b>RARELY</b>	<b>SOMETIMES</b>	<b>GENERALLY</b>	<b>ALWAYS</b>
Do you regularly study at the same time?	39(11.1)	217 (62.0)	31 (8.9)	63 (18.0)
Do you have an area where you always study?	80(22.8)	104 (29.6)	59 (16.8)	108(30.8)
Is your study area where you always go to study?	60(17.0)	168 (47.7)	45 (12.8)	79 (22.4)
Do you have all your supplies near you when you study?	39(11.2)	140 (40.1)	57 (16.3)	113(32.4)
Is your area comfortable?	40(11.5)	82 (23.6)	56 (16.1)	169(48.7)
Can you study for at least a half hour without getting up, walking about, taking snacks, or TV, or phone breaks?	50(14.4)	177 (50.9)	42 (12.1)	79 (22.7)
Do your friends leave you alone when they know you want to study?	32 (9.1)	139 (39.6)	48 (13.7)	132(37.6)
Do you use your time between classes to study?	44(13.0)	136 (40.1)	44 (13.0)	15 (33.9)



The rating on the study environment in questions one, three, four, six, seven and eight were scored at a medium rate of sometimes which is rated at 2 points. Questions two and five were rated high with the score of 4 for always. The expectation would be a not significant relationship with performance in Mathematical Literacy.

**Table 4.8: Association between socio-demographic factors and study environment scores**

Variables	Frequency (n)	Mean	SD	p-value
Age (years)				
15-20	243	20.89	3.47	0.518
21 and above	46	21.26	3.87	
Gender				
Male	166	20.70	3.61	0.269
Female	128	21.16	3.50	
Locality				
Urban	46	19.76	3.35	0.014
Rural	245	21.16	3.52	
Student type				
Boarder	35	21.46	3.82	0.355
Day	255	20.87	3.50	

In the socio-demographic factors on study environment on the location of schools, urban variable was significantly related to academic performance with  $p \leq 0.014$ . Age was

$p \geq 0.518$ , gender had a  $p \geq 0.269$ ; student type were not significantly related to performance with  $p \geq 0.355$ .

**Table 4.9: Results of Ordinary least square regression showing relationship between study environment scores and academic performance in maths literacy**


	Unstandardized Coefficient (B)	Standard Error	Standardized coefficient	T	P
Constant	54.57	9.67		5.64	0.000
Age	-0.83	0.41	-0.12	-2.04	0.043
Gender	3.08	1.54	0.12	2.00	0.046
Locality	-11.01	2.10	-0.30	-5.25	0.000
Study environment	0.13	0.21	0.04	0.61	0.543
Model adjusted R <sup>2</sup>	0.101				



The p value for the age was  $p \leq 0.043$ , for gender  $p \leq 0.046$  and locality was  $p \leq 0.00$  and were significantly related to academic performance. After controlling for demographic factors, study environment was not significantly associated with academic performance in Mathematical Literacy with the p-value of  $p \geq 0.543$ .

### 4.6.3 Test Taking/preparation Skills and Performance

**Table 4.10: Test Taking/Preparation Skills**

<b>VARIABLES</b>	<b>RARELY</b>	<b>SOMETIMES</b>	<b>GENERALLY</b>	<b>ALWAYS</b>
Do you study for each class every day?	43(12.1)	111 (31.3)	46 (13.0)	155(43.7)
Do you start reviewing for major exams at least 3 days in advance?	23 (6.6)	157 (44.7)	50 (14.2)	121(34.5)
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Do you belong to a study group?	91(25.6)	126 (35.4)	46 (12.9)	93 (26.1)
Do you attend extra help sessions or office hours provided by the instructor?	107(30.1)	133 (37.4)	35 (9.8)	81 (22.8)
Can you spot what type of questions will be on the test?	34 (9.8)	187 (53.7)	60 (17.2)	67 (19.3)
Are you able to finish your tests in the allowed period of time?	15 (4.3)	115 (33.0)	51 (14.6)	168(48.1)

If you do not do well on a test, do you review it with the instructor and/or analyse it to see where you had problems?

37 (10.5)      109 (31.0)      58 (16.5)      148(42.0)

Test taking and preparation skills for examinations had seven questions that were designed to rate how prepared the learners were in their study habits for tests and examinations. The questions included daily study, reviewing for examinations, study groups, extra help offered, likelihood of spotting the questions to be asked and whether they finish on time and revise the answers.

The first question was rated at n=155, 44% in the *always* category or highest score; the second had a middle score of n=157, 45% in the *sometimes* category; third also in the middle score of *sometimes* at n=126, 35%; fourth rated *sometimes* at n= 133, 37%; fifth was n=187, 54% at *sometimes* (middle); sixth was n=168, 48% at *always* which is the highest rating and the seventh was n= 148, 42% also in the highest rating category. *Always* carried the highest scores of rating, which only appeared two times in response to the last two questions. The expectation would be *almost significant*.

**Table 4.11: Association between socio-demographic factors and test taking scores**

Variables	Frequency (n)	Mean	SD	p-value
Age (years)				
15-20	256	18.70	3.27	0.303
21 and above	48	19.22	3.42	
Gender				
Male	175	18.70	3.29	0.637
Female	134	18.88	3.27	
Locality				
Urban	59	18.31	3.04	0.179

Rural	246	18.94	3.32	
Student type				
Boarder	40	20.35	2.86	0.001
Day	259	18.56	3.25	

In the association between socio-demographic factors, there was a significant relationship between the types of learners in the boarding-school with academic performance with a p-value of 0.001.

**Table 4.12: Results of Ordinary least square regression showing relationship between test taking and academic performance in Mathematical Literacy**

	Unstandardized Coefficient (B)	Standard Error	Standardized coefficient	T	P
Constant	55.83	9.33		5.98	0.000
Age	-0.91	0.41	-0.13	-2.22	0.027
Gender	1.58	1.52	0.06	1.04	0.301
Locality	-8.19	1.89	-0.25	-4.34	0.000
Test taking	-0.03	0.23	-0.01	-0.11	0.912
Model adjusted R <sup>2</sup>	0.069				

The results of ordinary least square regression showed a relationship in both the location of the school ( $p=0.000$ ) and age of the learners ( $p=0.027$ ); these had a significant relationship in the academic performance.

#### 4.6.4 Note Taking and Performance



There is significant relationship with note taking and academic performance, especially among female learners.

**Table 4.13: Note Taking**

VARIABLES	RARELY	SOMETIMES	GENERALLY	ALWAYS
Are you able to take notes in class/keep up with the teacher, and understand the lesson the same time?	13 (3.6)	148 (41.5)	50 (14.0)	146(40.9)
Are you good at note taking?	27 (7.5)	100 (27.9)	75 (20.9)	157(43.7)
Do you look at your notes after each class,	34 (9.4)	177 (49.2)	42 (11.7)	107(29.7)

preferably right after class?

Do you know what the “important stuff” to write down is and what is not important?	35 (9.9)	110 (31.3)	77 (21.9)	130(36.9)
Can you put class notes or notes from texts into your own words?	52 (14.1)	156 (44.6)	52 (14.9)	90 (25.7)

Note taking was composed of five questions to identify whether the learners were able to keep up with the teacher following the lesson and also write notes. It was also to identify whether the learners were able to check whether notes were taken correctly and also put the class notes or textbook information in their own wording.

The scores were rated at a mediocre level because they scored mostly in the middle level of the rating score, which is ‘sometimes’ and rated 2 to a total score of 4.



**Table 4.14: Association between socio-demographic factors and note taking score**

Variables	Frequency (n)	Mean	SD	p-value
Age (years)				
15-20	274	14.00	2.67	0.846
21 and above	47	13.91	2.55	
Gender				
Male	178	13.70	2.80	0.058
Female	148	14.26	2.43	
Locality				
Urban	59	13.10	2.83	0.007
Rural	263	14.13	2.59	



Student type

Boarder	41	14.05	2.48	0.780
Day	274	13.92	2.71	

Socio-demographic results showed that there was no significant relationship between note taking and socio-demographic factors. Only urban learners showed a significant relationship.



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**Table 4.15: Results of Ordinary least square regression showing relationship between note taking and academic performance in maths literacy**

	<b>Unstandardized Coefficient (B)</b>	<b>Standard Error</b>	<b>Standardized coefficient</b>	<b>T</b>	<b>P</b>
Constant	47.79	9.00		5.31	0.000
Age	-0.92	0.40	-0.13	-2.34	0.020
Gender	0.36	1.43	0.01	0.25	0.802
Locality	-7.88	1.85	-0.24	-4.25	0.000
Note taking	0.66	0.27	0.14	2.47	0.014

Model            0.074  
adjusted R<sup>2</sup>

The results of the ordinary least square regression showed the relationship between note taking and academic performance in Mathematical Literacy. Only gender did not show significance between performances in Mathematical Literacy.

#### **4.6.5 Reading Skills and Performance**

The table below shows the relationship between reading skills and academic performance in Mathematical Literacy



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**Table 4.16: Reading skills**

VARIABLES	RARELY	SOMETIMES	GENERALLY	ALWAYS
Can you read and learn at the rate of 12-15 pages per hour for history-type material?	112(31.4)	170 (47.6)	33 (9.2)	42 (11.8)
Do you keep up with the readings for all your classes?	34 (9.6)	179 (50.3)	44 (12.4)	99 (27.8)
Can you concentrate and understand the material you read without re-reading a second or third time?	62 (17.4)	178 (49.9)	58 (16.2)	59 (16.5)
Do you adjust your reading styles when you are reading for literature, social science, or science classes?	51 (14.3)	155 (43.5)	68 (19.1)	82 (23.0)
Do you do your study-reading during the part of the day when you are most alert?	32 (9.2)	169 (48.4)	58 (16.6)	90 (25.8)



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The participants in Table 4.16 scored in the middle with *sometimes* which is 2 over 4 points. The first question was n=170, 48%; the second question was n=179, 50%; the third question was n=178=50%; the fourth question was n=155, 44% and the last question was n=168, 48%. The expectation was a not significant relationship in performance.

**Table 4.17: Association between socio-demographic factors and Reading skills**

<b>Variables</b>	<b>Frequency (n)</b>	<b>Mean</b>	<b>SD</b>	<b>p-value</b>
Age (years)				
15-20	274	12.05	2.61	0.730
21 and above	54	12.19	2.60	
Gender				
Male	185	12.12	2.85	0.566
Female	147	11.96	2.25	
Locality				
Urban	56	11.17	2.54	0.005
Rural	271	12.25	2.58	
Student type				
Boarder	41	12.49	2.50	0.280
Day	280	12.01	2.63	



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Socio-demographic factors on the locality of the school has a significant relationship with academic performance in with a p-value for the urban  $p \leq 0.005$ . This indicates that reading skills of learners from the urban areas impact on their performance because of the environment and some other factors.

**Table 4.18: Results of Ordinary least square regression showing relationship between reading skills and academic performance in maths literacy**

	<b>Unstandardized Coefficient (B)</b>	<b>Standard Error</b>	<b>Standardized coefficient</b>	<b>T</b>	<b>P</b>
Constant	51.74	8.70		5.95	0.000
Age	-0.99	0.39	-0.14	-2.55	0.011
Gender	1.91	1.44	0.07	1.33	0.185
Locality	-8.98	1.92	-0.26	-4.68	0.000
Reading skills	0.51	0.27	0.10	1.89	0.060
Model adjusted R <sup>2</sup>	0.080				

Reading skills have no significant relationship with performance. This means that learners are to have good reading skills go together with study habits; these are of great benefit to learners because these habits help learners to be creative and prepared for examinations, whether final or for school work. Age and locality had a significant relationship with performance although the overall results were not significant.

#### 4.6.6 Writing Skills and Performance

**Table 4.19: Writing skills**

VARIABLES	RARELY	SOMETIMES	GENERALLY	ALWAYS
Are you comfortable with your command of English grammar, punctuation and spelling?	25 (6.9)	123 (34.0)	68 (18.8)	146(40.3)
Do you have a clear idea of what the instructor requires for a writing assignment?	19 (5.3)	161 (44.7)	74 (20.6)	106(29.4)
Do you make an outline of your paper, starting with the topic and outlining how the subsequent paragraph will support your topic?	45 (12.6)	150 (42.1)	70 (19.7)	91 (25.6)
If you are assigned a research paper, do you know how to use the library to research your topic?	28 (7.8)	94 (26.3)	58 (16.2)	177(49.6)
Do you start your research in time to complete it and write your paper without pulling an all-nighter just before the paper is due?	39 (11.0)	161 (45.2)	55 (15.4)	101(28.4)
Are you able to communicate effectively in writing?	23 (6.9)	129 (38.5)	65 (19.4)	118(35.2)



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The scores in this table are high in the ratings of (2) two and four, which is an indication that the participants may have acceptable skills in writing but not high and reach the value of (4) in rating. In the English grammar and the use of the library, the rating is high. This

may have an advantage in their performance because of their good command in English as a medium of instruction.

**Table 4.20: Association between socio-demographic factors and writing skills**

Variables	Frequency (n)	Mean	SD	p-value
Age (years)				
15-20	264	16.91	2.99	0.640
21 and above	50	16.70	2.70	
Gender				
Male	178	16.56	3.06	0.033
Female	141	17.26	2.75	
Locality				
Urban	58	16.66	3.01	0.495
Rural	256	16.95	2.95	
Student type				
Boarder	41	17.93	2.99	0.016
Day	267	16.73	2.95	



Male ( $p \leq 0.033$ ) and boarding participants ( $p \leq 0.016$ ) show a significant association between socio-demographic factors and writing skills.

**Table 4.21: Results of Ordinary least square regression showing relationship between writing skills and academic performance in maths literacy**

	<b>Unstandardized Coefficient (B)</b>	<b>Standard Error</b>	<b>Standardized coefficient</b>	<b>T</b>	<b>P</b>
Constant	42.06	9.56		4.40	0.000
Age	-0.74	0.39	-0.10	-1.87	0.062
Gender	1.33	1.48	0.05	0.90	0.369
Locality	-8.72	1.87	-0.26	-4.65	0.000
Writing skills	0.658	0.24	0.15	2.70	0.007
Model adjusted R <sup>2</sup>	0.090				



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According to the results of ordinary least square regression that indicate relationships, there is a significant relationship with writing skills and performance at the p value of ( $p \leq 0.007$ ). This is an indication that the skills are an important factor in performance and need to be honed and developed to produce better quality of learners. Good writing skills enhance the career and creativity of students. It also helps students to express themselves adequately with clear articulation of the subject matter.



#### 4.6.7 Mathematical Skills and Performance

**Table 4.22: Mathematical Literacy Skills**

<b>VARIABLES</b>	<b>RARELY</b>	<b>SOMETIMES</b>	<b>GENERALLY</b>	<b>ALWAYS</b>
Do you have a good command of the pre-requisite skills for the math class in which you are enrolled?	44 (12.4)	211 (59.4)	44 (12.4)	56 (15.8)
Do you always do your homework assignments and work the problems before looking at the solutions?	20 (5.5)	137 (38.0)	53 (14.7)	151(41.8)
Do you participate in class and ask question when you do not understand a concept or formula?	38 (10.6)	136 (37.9)	41 (11.4)	144(40.1)
Do you at most times miss only two maths classes per semester?	135(39.0)	138 (39.9)	43 (12.4)	30 (8.7)
Can you explain to another student how to solve all the problems on a maths test?	43 (12.0)	174 (48.5)	58 (16.2)	84 (23.4)
Do you have enough time after taking your tests to review for calculation errors and stupid mistakes like misplaced + or – sign?	43 (12.1)	164 (46.3)	49 (13.8)	98 (27.7)



The response of the learners in the first question was more on the *sometimes* rating which carries 2 points at n=211, 59%. The second had the highest rating of n=151, 41%; the third question had n=144, 40%. The respondents reverted to the 'sometimes' category, which carries 2 points in the fourth question; it is the same with the fifth and sixth questions, which scored at 2 points in totality.

**Table 4.23: Association between socio-demographic factors and maths literacy**

Variables	Frequency (n)	Mean	SD	p-value
Age (years)				
15-20	272	14.93	3.16	0..060
21 and above	50	15.84	2.89	
Gender				
Male	170	21.91	3.66	0.773
Female	117	22.03	3.32	
Locality				
Urban	59	14.73	3.53	0.302
Rural	265	15.19	3.02	
Student type				
Boarder	41	15.07	3.00	0.947
Day	278	15.11	3.15	



In socio-demographic factors, the results showed no significance with performance in Mathematical Literacy

**Table 4.24: Results of Ordinary least square regression showing relationship between Mathematical Literacy skills and academic performance in maths literacy**

Unstandardized Coefficient (B)	Standard Error	Standardized coefficient	T	P
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Constant	43.41	8.87		4.89	0.000
Age	-0.83	0.40	-0.11	-2.08	0.039
Gender	1.65	1.43	0.06	1.15	0.250
Locality	-8.71	1.84	-0.26	-4.74	0.000
Maths Literacy	0.747	0.23	0.18	3.32	0.001
Model adjusted R <sup>2</sup>	0.096				

There is significant relationship between Mathematical Literacy skills and academic performance. Mathematical Literacy is a very important subject in this study and needs to be understood well. According to Table 4.24, Mathematical Literacy had a p-value of  $p \leq 0.001$ , which shows that the relationship is significant. Academic performance in Mathematical Literacy may have different causes or some underlying factors that are not considered in the study that affect students' performance. In study habits, Mathematical Literacy showed significant relationship, note taking ( $p \leq 0.014$ ) and writing skills.



Three of the factors in the study habits, namely, note taking, writing skills and Mathematical Literacy level showed significant relationship with academic performance. Time management, study environment, test taking preparation and reading skills were not significant. There are only three significant factors in the hypothesis that show correlation with academic performance. The hypothesis cannot be rejected because time management, study environment, test taking preparation and reading skills can have different implications on participants even though there is no significant relationship with academic performance.

#### 4.7 Hypothesis Two – Significant relationship between learning styles and performance

The results for Pearson’s correlation analysis of learning styles and academic performance in Mathematical Literacy were observed in the following table.

**Table 4.25: Pearson’s Correlation Analysis of Performance in Learning Styles and Academic Performance**


	 University of Fort Hare <i>Together in Excellence</i>	<b>Mathematics score</b>
Mathematics score		1
Visual Language		0.099
Visual Numerical		0.027
Social Individual		0.062
Social Group		-0.075
Auditory Language		-0.117*
Auditory Numeric		0.136*
Auditory visual		0.033
Expressiveness Oral		0.002
Expressiveness written		0.091

Table 4.25 reflects learning styles and academic performance, which was one of the variables for the study. It showed no significance with learning styles and academic performance. All the correlation coefficients were very low; regarding the significance level, there was no correlation between performance and learning styles. Hypothesis two stated that, “there is no significant relationship between learning styles and the academic performance in Mathematical Literacy.”

The hypothesis was tested under nine factors using the Likert scale of 1 to 4 for rating. Learning styles were measured based on gender, location and Mathematical Literacy, and their effects on academic performance as follows:

- (a) Visual Language
- (b) Visual Numerical
- (c) Social-Individual
- (d) Social-Group
- (e) Auditory Language
- (f) Auditor Numerical
- (g) Auditor-Visual-Kinesthetic
- (h) Expressiveness-Oral
- (i) Expressiveness-Written



#### 4.7.1 Visual Language and Performance

**Table 4.26: Visual Language**

VARIABLES	RARELY	SOMETIMES	GENERALLY	ALWAYS
Having assignment directions written on the board makes them easier to understand	23 (6.4)	152 (42.6)	54 (15.1)	128(35.9)
I would rather read a story than listen to it read	28 (7.8)	133 (36.8)	61 (16.9)	139(38.5)

I like written directions better than spoken ones	39 (10.9)	127 (35.5)	55 (15.4)	137(38.3)
I would rather read things in a book than have the teacher tell me about them	70 (19.4)	168 (46.5)	46 (12.7)	77 (21.3)
I remember the spelling of a word better if I see it written down than if someone spells it out loud	42 (11.8)	138 (38.7)	64 (17.9)	113(31.7)

Table 4.26 is a summary of responses of participants to the questions that were contained in the section for visual language. The first was n=152, 43% which is two scores, second was the highest at 4 points, n=139, 39%, the third was also highest at four points n=137, 38%, the fourth question rated at a level 2 points in scores, n=168, 47%. The last question had a second rating, that is, *sometimes* which has a score of 2 at n=138, 39%.

**Table 4.27: Association between socio-demographic factors and visual language**

Variables	Frequency (n)	Mean	SD	p-value
Age (years)				
15-20	287	13.61	2.67	0.428
21 and above	47	13.28	2.64	
Gender				
Male	188	13.47	2.67	0.494
Female	152	13.67	2.63	
Locality				
Urban	59	13.58	2.53	0.972
Rural	279	13.56	2.67	
Student type				
Boarder	45	13.91	3.10	0.347
Day	287	13.51	2.59	

There was no significant relationship between socio-demographic factors and visual language in performance. The frequency in the age group of 15 to 21 is n=287. In gender, it was high amongst male learners with a frequency of n=188, it was high in rural location with a frequency n=279; it was also high in the type of school with a frequency of 287. There is no significant relationship between socio-demographic and academic performance.

**Table 4.28: Results of Ordinary least square regression showing relationship between Visual Language score and academic performance in maths literacy**

	<b>Unstandardized Coefficient (B)</b>	<b>Standard Error</b>	<b>Standardized coefficient</b>	<b>T</b>	<b>P</b>
Constant	48.50	9.44		5.14	0.000
Age	-0.80	0.39	-0.11	-2.02	0.044
Gender	1.59	1.40	0.06	1.13	0.26
Locality	-8.62	1.84	-0.25	-4.68	0.000
Visual Language score	0.39	0.26	1.51	1.51	0.131
Model adjusted R <sup>2</sup>					

There is significant relationship in age at a p-value of  $p \leq 0.044$  and locality at a p-value of  $p \leq 0.00$  with performance. Visual-language, as it was tested as one of the categories of learning styles, is an indication that learners are to be screened, not in a negative way,

but to identify the weak points that need to be addressed. A student may get into a classroom not aware that they have visual challenges or an educator can take it for granted that all the learners are capable of visual-language. Visual-language is based on learners' best preferences since some learners may be good at auditory-language than at visual. A learner may prefer to read than write or listen than write.

#### 4.7.2 Visual Numerical and Performance

**Table 4.29: Visual Numerical**

<b>VARIABLES</b>	<b>RARELY</b>	<b>SOMETIMES</b>	<b>GENERALLY</b>	<b>ALWAYS</b>
I understand a maths problem that is written down better than the one I hear	37 (10.3)	164 (45.6)	42 (11.7)	117(32.5)
Written maths problems are easier for me to do than an oral ones	35 (9.8)	140 (39.2)	66 (18.5)	116(32.5)
Seeing a number makes more sense to me than hearing a number	45 (12.5)	120 (33.4)	66 (18.4)	128(35.7)
Seeing the price of something written down is easier for me to understand than having someone tell me the price	53 (15.0)	141 (39.9)	52 (14.7)	107(30.3)
When the teachers say a number, I really do not understand it until I see it written down	112(32.3)	140 (40.3)	35 (10.1)	60 (17.3)



In almost all the questions, the learners attained medium rating except for the third question in which they attained the highest score. There may be some specific underlying reasons that may cause the learners to be rated medium.



**Table 4.30: Association between socio-demographics factors and visual-numerical**

<b>Variables</b>	<b>Frequency (n)</b>	<b>Mean</b>	<b>SD</b>	<b>p-value</b>
<b>Age (years)</b>				
15-20	272	12.92	2.91	0.508
21 and above	47	13.21	2.37	
<b>Gender</b>				
Male	178	13.20	2.81	0.172
Female	146	12.76	2.90	
<b>Locality</b>				
Urban	60	13.15	2.30	0.688
Rural	261	12.98	2.98	
<b>Student type</b>				
Boarder	39	12.60	3.02	0.320
Day	275	13.08	2.85	



The association between socio-demographics and visual-numerical factors had no significant relationship with performance.

**Table 4.31: Results of Ordinary least square regression showing relationship between Visual Numeric score and academic performance in maths literacy**

	<b>Unstandardized Coefficient (B)</b>	<b>Standard Error</b>	<b>Standardized coefficient</b>	<b>T</b>	<b>P</b>
Constant	52.86	9.22		5.73	0.000
Age	-0.89	0.40	-0.12	-2.23	0.026
Gender	1.72	1.46	0.07	1.18	0.238
Locality	-7.58	1.86	-0.23	-4.07	0.000
Numeric Number score	0.08	0.25	0.02	0.32	0.752

### Visual-Numerical and Performance



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The results showed that there is no significant relationship between performance and visual-numerical factors. Learners who are visual-numerical understand mathematical problem better when it is written down. They need to visualize it to be able to understand the problem whether it is mathematical or otherwise. This is also another type of learning style which needs to be identified when an educator is teaching.

Age, with a p-value of  $p \leq 0.026$  and locality, with the p-value of  $p \leq 0.000$  had a significant relationship with visual-numerical and performance

### 4.7.3 Social-Individual and Performance

**Table 4.32: Social-Individual**

**VARIABLES**                      **RARELY**    **SOMETIMES**    **GENERALLY**    **ALWAYS**

I learn best when I study alone	28 (7.7)	135 (37.1)	39 (10.7)	162(44.5)
I remember more of what I learn if I learn it when I am alone	25 (6.9)	121 (33.4)	67 (18.5)	149(41.2)
It is more fun to learn with classmates at first, but it is hard to study with.(other learners)	33 (9.2)	185 (51.7)	54 (15.1)	86 (24.0)
I study best when no one is around to talk or listen to	30 (84.)	102 (28.4)	52 (14.5)	175(48.7)
I cannot think as well when I work with someone else as when I work alone	46 (12.8)	170 (47.2)	50 (13.9)	94 (26.1)

The social-individual section had five questions, and the total score was four (4) at a rate of 1, 2, 3 and 4. In the first question, the participants scored 4 points with n=162, 45%, which is rated highest. The second question also scored 4 points with n=149, 41%, also the highest. The third question scored 2 points with n=185, 52%, which the midpoint. The fourth question was also the highest with a score of 4 points at n=175, 49%; lastly, the score fifth question was rated at 2 points which is the middle with n=170, 47%. It was expected that the learners would prefer to study alone.

**Table 4.33: Association between socio-demographic factors and social-individual score**

Variables	Frequency (n)	Mean	SD	p-value
Age (years)				
15-20	286	14.22	2.99	0.042
21 and above	52	13.32	2.37	
Gender				
Male	192	13.97	2.89	0.497
Female	152	14.19	2.99	

Locality					
Urban	58	13.45	2.87	0.068	
Rural	282	14.22	2.92		
Student type					
Boarder	43	14.20	3.13	0.742	
Day	289	14.05	2.89		

The age category in the socio-demographic factors had a high frequency in the 15 to 21 year group at n=286 and a significant relationship of  $p \leq 0.042$ . The frequency for male learners was high at n=192, the locality was n=282 in the rural area and student type was n=289 in the day schooling learners. The last three categories did not have a significant relationship because their  $p$  values were higher than the 0.05.



**Table 4.34: Results of Ordinary least square regression showing relationship between Social Individual score and academic performance in Maths literacy**

	<b>Unstandardized Coefficient (B)</b>	<b>Standard Error</b>	<b>Standardized coefficient</b>	<b>T</b>	<b>P</b>
Constant	50.68	9.24		5.49	0.00
Age	-0.79	0.39	-0.11	-2.00	0.046
Gender	1.48	1.41	0.06	1.05	0.295
Locality	-8.87	1.87	-0.25	-4.74	0.000

Social Individual score	0.25	0.24	0.06	1.05	0.296
Model adjusted R <sup>2</sup>	0.07				

Social individual compared to academic performance was significant in age at ( $p \leq 0.046$ ), location was also significant at ( $p \leq 0.000$ ) and the gender was non-significant. Measuring the social individual in relation to academic performance examines whether an individual needs others to work with or is more comfortable on his/her own. According to the results, learners do not get affected by studying alone, that is, they prefer to study alone than in a group.



#### 4.7.4 Social-Group and Performance

**Table 4.35: Social-Group**

VARIABLES	RARELY	SOMETIMES	GENERALLY	ALWAYS
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If I need help in the subject, I will ask a classmate for help	22 (6.1)	127 (35.2)	40 (11.1)	172(47.6)
I like to work in a group because I learn from the others in the group.	46 (12.8)	156 (43.3)	49 (13.6)	109(30.3)
I get more work done when I work with someone	30 (8.5)	143 (40.3)	57 (16.1)	125(35.2)
I can learn more about a subject if I am in a small group	43 (12.0)	152 (42.5)	62 (17.3)	101(28.2)
I like to study with other people	49 (13.7)	178 (49.9)	34 (9.5)	96 (26.9)

The responses in the social-group showed the first question to have the highest rating by scoring 4 points. Questions two to five had a rating of two points, which is the middle of the scale. This may suggest that the learners are not comfortable in studying in groups or help from classmates.



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**Table 4.36: Association between socio-demographic factors and socio-group**

<b>Variables</b>	<b>Frequency (n)</b>	<b>Mean</b>	<b>SD</b>	<b>p-value</b>
Age (years)				
15-20	283	13.43	3.16	0.099
21 and above	53	14.22	3.57	
Gender				
Male	189	13.28	3.14	0.092

Female	153	13.88	3.36	
Locality				
Urban	60	13.70	3.15	0.719
Rural	277	13.53	3.25	
Student type				
Boarder	43	14.58	3.36	0.022
Day	286	13.38	3.17	

The association between socio-demographic factors and social group shows that age, gender and locality have no significant relationship with performance. The type of student category has a significant relationship with performance at ( $p \leq 0.022$ ) with the boarding learners. This may be encouraged by the fact that the learners are already in the same vicinity, sharing rooms with the rest in the boarding facility.



**Table 4.37: Results of Ordinary least square regression showing relationship between social-group and academic performance in maths literacy**

	Unstandardized Coefficient (B)	Standard Error	Standardized coefficient	T	P
Constant	57.37	8.46		6.78	0.000
Age	-0.78	0.38	-0.11	-2.03	0.043

Gender	1.36	1.42	0.05	0.96	0.337
Locality	-8.46	1.84	-0.25	-4.58	0.000
Social-group	-0.27	0.22	-0.07	-1.23	0.221
Model adjusted R <sup>2</sup>	0.071				

### Social Group and Performance

The age at the ( $p \leq 0.043$ ) and locality at ( $p \leq 0.000$ ) show that there is a significant relationship with academic performance. The gender is not significant at ( $p \geq 0.337$ ). On the whole academic performance is not related to social group at the p-value of  $p \geq 0.221$ , that is, learners, *sometimes* or *seldom* study in a group or they may not depend much on group discussions.



### 4.7.5 Auditory-Language and Performance

**Table 4.38: Auditory-Language**

VARIABLES	RARELY	SOMETIMES	GENERALLY	ALWAYS
I learn better if someone reads a book to me than if I read silently to myself	90 (25.2)	149 (41.7)	31 (8.7)	87 (24.4)



I remember things I hear better than I read	53 (14.7)	180 (49.9)	49 (13.6)	79 (21.9)
I find it easier to remember what I have heard than what I have read	52 (14.6)	170 (47.8)	53 (14.9)	81 (22.8)
I understand more from a class discussion, than from reading about a subject	35 (9.9)	180 (50.7)	67 (18.9)	73 (20.6)
I do well on tests if they are about things I hear in class	18 (5.1)	121 (34.4)	57 (16.2)	156(44.3)

Regarding the auditory-language, questions are to identify whether the learner prefers to be read to and understand it better, a class discussion or to be tested on things that the learner hears in class. The results in the first four questions were in the medium scoring rate while the last one was scored at a high rate of 4 points.



**Table 4.39: Association between socio-demographic factors and auditory language**

<b>Variables</b>	<b>Frequency (n)</b>	<b>Mean</b>	<b>SD</b>	<b>p-value</b>
Age (years)				
15-20	260	12.55	2.82	0.036

21 and above	53	13.45	3.04	
Gender				
Male	190	12.85	2.94	0.289
Female	149	12.52	2.81	
Locality				
Urban	60	12.38	2.81	0.301
Rural	274	12.81	2.91	
Student type				
Boarder	44	13.16	2.79	0.248
Day	283	12.62	2.89	

The scores in the socio-demographic factors had a relationship that was not significant with performance in all areas except for age with a p-value of  $p \leq 0.36$ .



**Table 4.40: Results of Ordinary least square regression showing relationship between Auditory-Language and academic performance in maths literacy**

	<b>Unstandardized Coefficient (B)</b>	<b>Standard Error</b>	<b>Standardized coefficient</b>	<b>T</b>	<b>P</b>
Constant	58.69	8.40		6.98	0.000
Age	-0.88	0.38	-0.13	-2.33	0.020

Gender	1.70	1.42	0.07	1.20	0.233
Locality	-7.95	1.86	-0.23	-4.28	0.000
Auditory- language	-0.37	0.24	-0.82	-1.53	0.128
Model adjusted R <sup>2</sup>	0.076				

The results of ordinary least square regression showing a relationship between auditory-language and academic performance in Mathematical Literacy showed no relationship at the value of ( $p \geq 0.128$ ).

Auditory language also had a positive relationship with academic performance around age and location. Since Mathematical Literacy is not much into the auditory but is written, auditory language may be positively significant with academic performance. This type of reading approach in mathematics belongs to the old system of education was called 'mental arithmetic'. Learners were to solve problems mentally without having the task written on the board.



#### 4.7.6 Auditory-Numerical and Performance

**Table 4.41: Auditory-Numerical**

**RARELY      SOMETIMES      GENERALLY      ALWAYS**

I do well on tests if they are about things I hear in class	21 (5.9)	130 (36.5)	50 (14.0)	155(43.5)
If someone tells me three numbers to add, I can usually get the right answer without writing them down	42 (11.7)	176 (49.0)	55 (15.3)	86 (24.0)
When I hear a phone number, I can remember it without writing it down	52 (14.6)	143 (40.1)	52 (14.6)	110(30.8)
When I have written math problem to do, I say it to myself to understand it better	46 (12.7)	159 (43.9)	64 (17.7)	93 (25.7)
It makes it easier when I say the numbers of a problem to myself as I work it out	33 (9.3)	169 (47.6)	75 (21.1)	78 (22.0)



The results of the response to the first question were high at the rate of 44% in the 4 points rating. The last four questions rated at a medium range of 2 points.

**Table 4.42: Association between socio-demographic factors and auditory-numerical**

Variables	Frequency (n)	Mean	SD	p-value
Age (years)				
15-20	280	13.09	2.89	0.121

21 and above	51	13.76	2.71	
Gender				
Male	185	13.16	2.87	0.911
Female	152	13.20	2.86	
Locality				
Urban	59	13.20	2.81	0.924
Rural	273	13.20	2.84	
Student type				
Boarder	41	13.85	3.21	0.109
Day	283	13.08	2.81	

The results of the association between socio-demographic factors and auditory-numerical were non-significant in both age, gender locality and type of student.

**Table 4.43: Results of Ordinary least square regression showing relationship between Auditory-Numerical and academic performance in maths literacy**

	Unstandardized Coefficient (B)	Standard Error	Standardized coefficient	T	P
Constant	42.59	8.70		4.90	0.000
Age	-0.67	0.39	-0.09	-1.74	0.083
Gender	1.91	1.42	0.07	1.35	0.178
Locality	-8.43	1.86	-0.25	-4.54	0.000
Auditory-numerical	0.62	0.24	0.14	2.55	0.011

The results of ordinary least square regression showing the relationship between auditory-numerical and academic performance in Mathematical Literacy showed a significant relationship of ( $p \leq 0.011$ ). Locality had significant relationship with performance at the p-value of  $p \leq 0.000$ .

#### 4.7.7 Auditory-Visual-kinaesthetic

**Table 4.44: Auditory-Visual-kinesthetic**

VARIABLES	RARELY	SOMETIMES	GENERALLY	ALWAYS
It makes it easier when I say the numbers of a problem to myself as I work on it.	46 (12.8)	173 (48.1)	58 (16.1)	83 (23.1)
Writing a spelling word several times helps me remember it better	32 (8.9)	95 (26.5)	66 (18.4)	165(46.1)
I like to do things like simple repairs or crafts with my hands	55 (15.2)	152 (42.0)	53 (14.6)	102(28.2)
I like to make things with my hands	45 (12.7)	108 (30.5)	53 (15.0)	148(41.8)
I understand what I have learned better when I am involved in making something for the subject	20 (5.7)	147 (41.8)	73 (20.7)	112(31.8)



The response of the participants in the five questions on auditory-visual kinesthetic was between the scores of two and four points. The first question had its highest rating at two points with 48%, n = 173; the second question was 46% in four points rating n=165, the third question was scored at 42%, n=152 highest rating of 4 points; the fourth question was 42%, n=148 and the last question was 42%, n=147 in the medium rating of 2 points.

**Table 4.45: Association between socio-demographic factors and auditory-visual**

Variables	Frequency (n)	Mean	SD	p-value
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Age (years)					
15-20	282	13.62	2.85	0.059	
21 and above	47	14.47	2.87		
Gender					
Male	187	13.96	2.84	0.115	
Female	147	13.46	2.85		
Locality					
Urban	57	13.47	3.06	0.451	
Rural	273	13.79	2.81		
Student type					
Boarder	42	13.45	2.93	0.531	
Day	280	13.75	2.86		

The association between socio-demographic factors and auditory-visual kinesthetic was not significant.



**Table 4.46: Results of Ordinary least square regression showing relationship between Auditory-Visual and academic performance in maths literacy**

	Unstandardized Coefficient (B)	Standard Error	Standardized coefficient	T	P
Constant	50.38	9.11		5.53	0.000
Age	-0.76	0.41	-0.10	-1.87	0.063
Gender	2.03	1.45	0.07	1.40	0.162
Locality	-9.25	1.90	-0.27	-4.88	0.000
Auditory-visual	0.25	0.25	0.05	1.00	0.315

**Auditory-Visual-Kinesthetic**

The learning styles variable in auditory-visual-kinesthetic has no positive relationship with academic performance. The learner usually says the word as he/she writes it. It is also to test whether the learner enjoys or prefers using hands in whatever tasks that which he/she is involved. This approach is usually done in the lower levels where learners use objects for calculation. The locality was significant at the p-value of  $p \leq 0.000$  although the others were not significant.

#### 4.7.8 Expressiveness-Oral and Performance

**Table 4.47: Expressiveness-Oral**

<b>VARIABLES</b>	<b>RARELY</b>	<b>SOMETIMES</b>	<b>GENERALLY</b>	<b>ALWAYS</b>
It's harder for me to do a written assignment than oral one	99 (27.3)	161 (44.5)	35 (9.7)	67 (18.5)
I feel like I speak smarter than I write.	59 (16.5)	166 (46.4)	47 (13.1)	86 (24.0)
If my homework were oral, I would do it all	55 (15.7)	114 (32.5)	49 (14.0)	133(37.9)
Speaking is a better way than writing if you want someone to understand it better	42 (11.7)	137 (38.3)	64 (17.9)	115(32.1)
Spelling and grammar rules make it hard for me to say what I want to in writing	67 (19.0)	196 (55.5)	39 (11.0)	51 (14.4)



Expressiveness-oral is based on the ability of the learner to him/herself orally. This means that a learner may prefer to speak and express him/herself more effectively than writing, hence the preference for oral assignment. The response to the five questions showed how the respondents scored based on the total of 4 points. The highest rating for the first question was 2 points; the second question was 2 points; the third question was 4 points; the fourth question was 2 points, and the last question was also 2 points.

The expectation was the middle of the rating or midpoint.



**Table 4.48: Association between socio-demographic factors and expressiveness-oral**

Variables	Frequency (n)	Mean	SD	p-value
Age (years)				
15-20	282	12.17	2.89	0.044
21 and above	52	13.06	2.93	
Gender				
Male	189	12.55	2.88	0.102
Female	150	12.03	2.91	
Locality				
Urban	58	12.50	2.72	0.605
Rural	277	12.29	2.90	
Student type				
Boarder	45	12.36	3.18	0.920
Day	282	12.31	2.85	

The 15 to 20 years of age had a frequency of 282 and a p value of (p=0.044). This showed significance in relationship between socio-demographic factors and expressiveness. The gender, locality and student type were not significant in relationship.

**Table 4.49: Results of Ordinary least square regression showing relationship between Expressiveness-oral and academic performance in maths literacy**

	Unstandardized Coefficient (B)	Standard Error	Standardized coefficient	T	P
Constant	55.85	8.51		6.56	0.000
Age	-1.03	0.39	-0.14	-2.66	0.008
Gender	1.67	1.40	0.07	1.19	0.234
Locality	-8.07	1.90	-0.23	-4.34	0.000
Expressiveness-oral	0.09	0.24	0.02	0.36	0.72
Model adjusted R <sup>2</sup>	0.071				

The results of the ordinary least square regression showing the relationship between expressiveness-oral and academic performance in Mathematical Literacy was significant with the p value of ( $p \geq 0.72$ ). Age and locality were significant, with the age with a p value of  $p \leq 0.008$  and locality being ( $p \leq 0.000$ ).



#### 4.7.9 Expressiveness-Written and Academic Performance

**Table 4.50: Expressiveness-Written**

VARIABLES	RARELY	SOMETIMES	GENERALLY	ALWAYS
Written assignments are easy for me	18 (4.9)	142 (38.9)	39 (10.7)	166(45.5)
I do not mind doing written assignments	12 (3.3)	113 (31.2)	72 (19.9)	165(45.6)
The things I write on paper sound better than when I say them	28 (7.7)	144 (39.8)	63 (17.4)	127(35.1)
I like tests that call for sentence completion or written answers	25 (6.9)	157 (43.5)	64 (17.7)	115(31.9)

Sometimes I say dumb things, but writing gives me time to correct myself.

13 (4.5)    92 (31.8)    43 (14.9)    141(48.8)

The rating on the first question is 46%, which is on the highest score of 4 points; the second question attained 46%. In the third question, the score was 2 points with a frequency of n=144 which is 40%. The fourth was also rated at 2 points with a frequency n=157 which is 44%. The last question scored the highest points (4) with a 49% and n=141.

**Table 4.51: Association between socio-demographic characteristics and expressiveness-written**

Variables	Frequency (n)	Mean	SD	p-value
Age (years)				
15-20	236	14.70	2.91	0.469
21 and above	44	15.05	2.62	
Gender				
Male	149	14.49	2.89	0.103
Female	136	15.04	2.83	
Locality				
Urban	49	14.18	2.80	0.117
Rural	232	14.89	2.87	
Student type				
Boarder	37	14.35	2.67	0.322
Day	237	14.86	2.91	

The relationship between socio-demographic characteristics and expressiveness-written had a higher frequency of 236 in the ages between 15 to 21, a frequency of 149 male in the gender category, a frequency of 232 with rural in the locality and with the day school

learners in the student type was 237. The high frequency of the rural and day scholars may have a negative or positive impact on their performance.

**Table 4.52: Results of Ordinary least square regression showing relationship between Expressiveness-written and academic performance in maths literacy**

	<b>Unstandardized Coefficient (B)</b>	<b>Standard Error</b>	<b>Standardized coefficient</b>	<b>T</b>	<b>P</b>
Constant	46.93	9.17		5.12	0.000
Age	-0.91	0.40	-0.14	-2.28	0.023
Gender	1.14	1.51	0.05	0.76	0.450
Locality	-7.11	2.00	-0.21	-3.55	0.000
Expressiveness-written	0.46	0.26	0.10	1.74	0.083
Model adjusted R <sup>2</sup>	0.063				



### **Written Expression and Performance**

Written expression is the ability to express one’s ideas in a written form. Some learners may prefer writing to vocally articulating themselves whilst others may be more vocally expressive. The written expression falls under the learning styles. The age and location were significant, and this was more among females According to the results, there was no significant relationship with academic performance.

There was no positive significant relationship with oral expression in Mathematical Literacy and academic performance. These are basically learning styles. Gender had

no significant relationship with Mathematical Literacy although age and locality of the school had some significance in performance.

#### 4. 8 Hypothesis Three

**Hypothesis three stated that, ‘there is no significant relationship between study habits and academic performance in Mathematics Literacy of Grade 11 students’.**

The hypothesis was tested under the following seven factors using the Likert scale of 1 to 4 for rating, namely:

- a. Time Management
- b. Your Study Environment
- c. Test Taking/Preparation Skills
- d. Note Taking Skills
- e. Reading Skills
- f. Writing Skills
- g. Mathematics/Mathematical Literacy



#### **Time Management**

Gender in time management had no significant relationship with performance in Mathematical Literacy. Table 4.5 showed results in association between socio-demographic characteristics and time management scores indicating the frequency of 170 and a p-value of ( $p \geq 0.773$ ). Thus, there is no significant relationship since the p-value is above the 0.05.

The results of ordinary least square regression showing a relationship between time management and academic performance in Mathematical Literacy had a p-value ( $p \geq 0.317$ ) which is non-significant.

## Study Environment

In this study, the study environment was based on measuring regular study time, where one always studies, access to supplies in the study area, how comfortable the area is, how long and often the breaks are taken and the control of the interference of friends in one's study time.

The results of ordinary least square regression showing a relationship between study environment scores and academic performance in Mathematical Literacy showed a p-value of ( $p \leq 0.046$ ), which is a significant relationship between study environment and academic performance.

## Test Taking and Preparation

Test taking preparation skills looked at class attendance, procedure followed in reviewing for examinations, group study discussions if any, attendance of extra hours of help by the instructor or educator, ability to sport the questions for the examinations, ability to finish on time when writing or sitting for examinations. Does the learner review the previous examination test together with the teacher and identify the emphasis that was expected?

The results on the test taking preparation in Table 4.12 on ordinary least regression on relationship between test taking preparation and academic performance in Mathematical Literacy, showed no significant relationship at the p-value of ( $p \geq 0.301$ ).

## Note Taking Skills

Note taking requires the ability to be good note taker who keeps up with the teacher on the other hand writing notes; this including the capability to put the notes in own words, identifying important points or areas of emphasis and reviewing the notes after class.

Table 4.15 showed the results on note taking skills in gender and the relationship with academic performance. There was no significant relationship between note taking and academic performance at the p-value of ( $p \geq 0.802$ ). The p-value was very high compared to the 0.05 significance level of the statistical probability.

## Reading Skills

One of the required skills to be tested for the learner in reading was the ability for the respondent to read 12 to 15 per hour for history-type material. The learner must be able to keep up with the required reading per lesson and adjust to the reading of the type of material being read and only when alert.

According to the results of the ordinary least square regression that indicates relationship, there is no significant relationship with reading skills and performance at the p value of ( $p \geq 0.185$ ).

### **Writing Skills**

The questions on writing skills were based on the command of English grammar, punctuation, spelling and effective communication in writing. When given an assignment, does the respondent understand the requirement of the assignment and create an outline to follow? It was also examined whether the learner was able to finish assignments on time or wait for the last moment.

The results on gender showed no significant relationship between writing skills and academic performance in Mathematical Literacy. Table 4.21 showed the p-value of ( $p \geq 0.369$ ).



### **Math/Mathematical Literacy Skills**

Good commands of mathematics or calculation skills were prerequisites of the Mathematical Literacy skills that were tested. When doing homework, the respondent would do the homework before looking for answers where there are answers at the back page. They were also tested for participation in class, number of classes missed per term and also if they can explain to other learners some of the problems to be solved and reviewed the test?

Table 4.24 shows the results of the ordinary least square regression displaying the relationship between gender and academic performance in Mathematical Literacy indicated that there was no significant relationship with the statistical significance level for the p-value of ( $p \geq 0.250$ ).

#### 4.9 Hypothesis Four

**Hypothesis four stated that, ‘there is no significant relationship between learning styles and academic performance in Mathematical Literacy of Grade 11 students.’**

The hypothesis was tested under the following seven factors using the Likert scale of 1 to 4 for rating. The learning styles were measured based on gender, location and Mathematical Literacy and their effects on academic performance as follows:

- (a) Visual Language
- (b) Visual Numerical
- (c) Social-Individual
- (d) Social-Group
- (e) Auditory Language
- (f) Auditor Numerical
- (g) Auditor-Visual-Kinesthetic
- (h) Expressiveness-Oral
- (i) Expressiveness-Written



#### **Visual Language**

Visual language focused on written assignment on the chalkboard as to whether it was easy to read and understand. The respondent was to choose whether he/she preferred reading a story from the book or to listen to someone reading to him/her and remembers how to spell a word when written than spoken.



The results in Table 4.28 of ordinary least square regression showing the relationship between visual language scores in gender and academic performance in Mathematical Literacy indicated no significant relationship with a p-value of ( $p \geq 0.26$ ).

### **Visual-Numerical**

The questions on visual-numerical were based on how better it is to solve a written problem in Mathematical Literacy than an oral one. Seeing a written-down price is easier to understand than mental calculations.

The results of the ordinary least square regression showing a relationship between gender in visual-numerical and academic performance in Mathematical Literacy were not significantly related at the p-value of ( $p \geq 0.238$ ) in Table 4.31.



### **Social Individual**

The learners were to respond to whether they preferred studying alone to remember more of what they learn; it is more fun to learn with the classmates but it is hard to study with them.

Gender in social individual had no relationship with academic performance in Mathematical Literacy. This is shown in Table 4.34 with a p-value of ( $p \geq 0.295$ ).

### **Social Group**

Social group required data on whether a learner would ask a classmate to help with a problem or subject and also learn more in a group than alone. It was anticipated to respond to whether the learner would get more work done with someone or prefer a small group for study purposes and that s/he likes to study with other people.

The results of the ordinary least square regression showing relationship between social group in gender and academic performance in Mathematical Literacy were not significantly related with a p-value of ( $p \geq 0.337$ ) in Table 4.37.

### **Auditory Language Skills**

To identify the learning styles of an individual learner in auditory language, the participants had to respond to the questions based on whether they understand more from class discussions, performed well in tests from the information heard in a class. They were also asked if they preferred to have someone to read a book for them.

The results of the ordinary least square regression indicating a relationship between auditory language and academic performance in gender were non-significant in Mathematical Literacy in Table 4.40.

### **Auditory Numerical Skills**

Auditory numerical is based on the ability to listen to numbers being dictated for addition, subtraction, division and multiplication and giving an answer orally, ability to hear a street number or a phone number and remember it without writing it down.

The results on gender had a p-value of ( $p \geq 0.178$ ) which shows no significant relationship with auditory numerical and performance in Mathematical Literacy in Table 4.43.

### **Auditory-visual Kinesthetic Skills**

Auditory visual kinesthetic factor is to test whether a learner likes to make things with hands, understanding better when hearing and involved in making something or experimenting with own hands. Testing for auditory-visual kinesthetic also involves understanding a problem when saying, seeing and writing it. An example is when a learner is writing a word, he/she must say or hear it whilst writing.

According to the results of the ordinary least square regression indicating relationship between auditory-visual kinesthetic and academic performance, there is no significant relationship in the p-value of ( $p \geq 0.162$ ) as revealed in Table 4.46.

### **Expressiveness Oral and Performance**

Expressiveness oral was to test whether the learners were comfortable in expressing themselves orally, view themselves as eloquent enough or can articulate their views perfectly.

Table 4.49 shows the results of the ordinary least square regression showing the relationship between expressiveness-oral and academic performance in Mathematical Literacy and gender. There is no significant relationship as the p-value is ( $p >= 0.234$ )

### **Expressiveness-Written and Performance**

Expressiveness-written looks at whether the learner regards written assignments as easier than oral. It also includes the assessment of things that are written on paper which are regarded as better. Writing is preferred because it gives time to correct some mistakes which cannot be corrected orally.

The results of the ordinary least square regression showing a relationship between expressiveness-written and academic performance in Mathematical Literacy with gender revealed that there was no significant relationship because of p-value which is higher than 0.05. The p-value is ( $p >= 0.234$ ) in Table 4.52.

### **4.10 Hypothesis Five**

**Hypothesis five stated that, 'there is no significant relationship between geographic locations of schools and academic performance in Mathematical Literacy of Grade 11 students'.**

**Table 4.53: Results of Ordinary least square regression showing the relationship between school location and academic performance in maths literacy**

	<b>Unstandardized Coefficient (B)</b>	<b>Standard Error</b>	<b>Standardized coefficient</b>	<b>T</b>	<b>P</b>
Constant	57.96	7.81		7.42	0.000
Age	-1.03	0.36	-0.15	-2.86	0.005

Gender	1.19	1.35	0.05	0.88	0.379
School location	-8.32	1.79	-0.24	-4.66	0.000
Model adjusted R <sup>2</sup>	0.075				

The above table (Table 4.53) is the test on the effects of the location of school whether they have a relationship with academic performance. The results show on the ordinary least square regression for relationship between school location and academic performance in Mathematical Literacy a significant relationship at the p-value of ( $p \leq 0.000$ ). School location had a significant relationship with academic performance in all factors of study habits and learning styles.

The conclusion on the fifth hypothesis is to not accept it based on the significant relationship between location and academic performance. The location of a school can have a significant relationship with academic performance or even no significant relationship though it may be located in an urban or rural area. Some of the underlying factors do influence the results. Since the study concentrated on specific variables, those other variables cannot be considered because that would be deviating the focus on the hypothesis which needed to be answered.

#### 4.11 Summary of the results

The results on the study habits indicated that there was a significant relationship between a. Note taking in Table 4.13; b. Writing Skills in Table 4.19 and Mathematical Literacy Table 4.22 with academic performance.

The learning styles did not have significant linear associations with academic performance except for location, age and gender. Other factors that affect study habits and learning styles had an impact on the variables.

##### 4.11.1 Socio-demographic Results in Study Habits

The following are results of a relationship between socio-demographic and academic performance in Mathematical Literacy results in study habits.

- a. Time management in a boarding type of school had a significant relationship with academic performance with the p-value of ( $p \leq 0.009$ ). There was also a significant relationship between age, gender and the location of school with academic performance in Mathematical Literacy in Table 4.3.
- b. Study environment had a significant p-value of ( $p \leq 0.014$ ) in Table 4.6.
- c. Test taking had a significant relationship between performance and location of school at a p-value of ( $p \leq 0.001$ ) in Table 4.9.
- d. Urban schools had a significant relationship between note taking and academic performance with the p-value of ( $p \leq 0.007$ ) in Table 4.11.
- e. Reading skills had no significant relationship.
- f. Writing skills in gender (male) had a p-value of ( $p \leq 0.033$ ) while student type (boarder) had a p-value of ( $p \leq 0.016$ ), which was significant with academic performance in Table 4.21
- g. Mathematical Literacy had no significant relationship.

#### 4.11.2 Socio-demographic Results in Learning Styles

The results on learning styles indicated no significant relationship between socio-demographic factors and academic performance in Mathematical Literacy, namely, visual language, visual numerical, social group, auditory-numerical, auditory-visual kinesthetic and expressiveness written.

The social individual had a significant relationship with academic performance in Mathematical Literacy with p-value of ( $p \leq 0.042$ ) in Table 4.32. The following also had a significant relationship with academic performance, namely, auditory language with a p-value of ( $p \geq 0.36$ ) in Table 4.36; expressiveness-oral had a significant relationship of a p-value of ( $p \leq 0.044$ ) in the age category of 15 to 21 years.

Study habits had a less than fifty percent (50%) significant relationship with academic performance. According to the proponents of study habits, there should be more than fifty percent of academic performance relationship (Bajwa, et al., 2011; Aquino, 2011; Bilge & Tuzgol Dost, 2014; Arsyad, 2018).

It would be expected that learning styles would have more significant relationship with academic performance in Mathematical Literacy as the previous researchers indicated the importance of learning styles (Bayazit, 2004; Donche, 2007; Farooq, 2011; Kolb, 2005).

## CHAPTER FIVE

### SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction



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The purpose of the study was to investigate the study habits and learning styles of high school students in Grade 11 as to whether there was a correlation between academic performance and Mathematical Literacy. Mathematical Literacy was chosen for this investigation because it was to supplement Mathematics for those learners who find it a challenge to do Mathematics (Bowie, 2006; Education, 2011; Allias, 2014). The ultimate purpose of the introduction of Mathematical Literacy in the education system was to improve academic performance amongst high school learners. Academic performance is an important factor in determining students' destiny in life. It was noted that students who perform well in high school have a better chance of admission in institutions of higher learning and also of getting employment (McCarthy, 2013). Poor academic achievement among high school students negatively influences the ability of the student to study further.

According to the results of the midyear examinations that were reviewed from the data that was collected, the lowest average achievement in Mathematical Literacy was 10% to

20% compared to other subjects, as shown in the school records. It is expected that learners go to school with the sole purpose of getting good grades and the best education as parents expect their children to perform well at school. Furthermore, the foremost purpose of teachers and educators is to have their students understand their lessons well for better academic performance. Poor academic performance is also a burden to the South African government; as a result, the education system is continually looking for best ways to improve performance, hence the introduction of Mathematical Literacy to the South African education system (Jansen, 2016). The study looked at the study habits and learning styles to determine if there is a correlation between academic performance and Mathematical Literacy and whether these two variables have an effect on academic performance on Mathematical Literacy.

Academic achievement is not the only benefit that the learners get from studying hard, they also develop habits that carry them throughout their career and lifetime. According to Covey (2004), knowledge which has the basic questions of 'what to and why to' connected to habits with skills and desire to know enhances effective study habits and identifies learning styles. Learners' study habits were under investigation to determine whether they have correlation with academic performance for those who are doing Mathematical Literacy. To get more understanding of the variables under scrutiny, age, gender, school type and locality of the school were also included as a means of comparing if there would be some significant relationship between academic performance in the study habits and learning styles. The study also looked at learning styles and their effects on both the learners and the educator. For performance, the mid-year results, that is, from January to June were analyzed. SPSS for windows version 20 statistical program was used to measure the internal consistency of the instruments and Microsoft Excel alternatively. Reliability of these instruments was computed using Cronbach's alpha.

## **5.2 Discussion of Findings**

The findings in this study provided some insights in the perceptions of study habits and learning styles among educators and learners as they relate to academic performance. There are some underlying factors that impact on the performance apart from what the study is based on. Those underlying factors will not be taken into consideration because the study is not addressing them but will be alluded to for the purposes of clarity. In the

findings, the researcher reviewed the theories advanced by the proponents of study habits and learning styles and also identified the relevance of the assumptions of the theorists. Five hypotheses were used in the study. The first hypothesis was to test the significant relationship between study habits and the academic performance of the Grade 11 learners in Mathematical Literacy. The findings in this study will provide the baseline information that will be needed in the implementation of the provision of the programs to improve academic performance of learners, not only in the Eastern Cape Province but nationwide.

### **5.2.1 Results on the Relationship between Study Habits and Academic Performance**

The first hypothesis was based on the following seven factors:

- a. Time management, which is based on being able to create a timetable to provide guidelines for the learner for time to study by allocating specific time for subjects according to their demands for time.
- b. Study environment which is a specific and conducive area to study in.
- c. Test Taking/Preparation skills that is, creating enough time to for the test and reviewing.
- d. Note taking skills is keeping up with the lesson and taking down notes.
- e. Reading skills is ability to read fast and identify the type of material to be read.
- f. Writing skills is the ability to structure the assignment and on time.
- g. Mathematics or Mathematical Literacy one has to be more acquainted or familiar with numbers.

These seven items were aimed to measure study habits to determine whether there was a correlation between academic performance amongst Grade Eleven pupils and Mathematical Literacy.





Collectively, the results had no significant relationship with academic performance. However, there were few items that showed a significant relationship with academic performance. Note taking had a p-value of  $p \leq 0.014$ , writing skills had a p-value of  $p \leq 0.007$ , and Mathematical Literacy had a p-value of  $p \leq 0.001$ . These items were components of the study habits and provided the study with the results that indicated the impact of study habits on the process of learning. Mathematical Literacy was introduced in South Africa as a subject that would assist learners in getting a better understanding of mathematical content and improve the academic performance. Learners were, therefore, expected to perform better since mathematics was replaced with Mathematical Literacy, which may be regarded as a subject for intervention in academic performance. The results of the study analysis were different from the expectations of better academic performance. This was also informed by the results on the analysis of the data collected to this regard and comparisons on the pass rates between 2007 and 2008 in Table 2.2. The year end results showed a phenomenon where the matriculation results did not improve after the introduction of Mathematical Literacy.

### **5.2.2 Results on the Relationship between the Learning Styles and Academic Performance**



The second hypothesis or objective tested the significant relationship between learning styles and academic performance in Mathematical Literacy. Testing of these objectives relied on nine factors which comprise the learning styles as identified by Kolb (2005).

They are as follows:

- a. Visual language in which a learner learns best when using visual aids and written material;
- b. Visual numerical a learner must see the numbers;
- c. Social individual a learner studies when alone no companions;
- d. Social group learners learns the best in a group;
- e. Auditory language when a learner prefers to be spoken to (lecturing);
- f. Auditory numerical is when a learner prefers hearing numbers, like mental arithmetic;

- g. Auditory visual kinesthetic is when a learner prefers hearing and touching, that is, experimenting;
- h. Expressiveness oral is a learner who can learn better in oral interaction with the teacher; and
- i. Expressiveness written is the learner who prefers written interaction.

The overall results showed a collective non-significant relationship between learning styles and academic performance in Mathematical Literacy. There were three exceptions, discussed below, which had a significant relationship between learning styles and performance.

Social individual showed a significant relationship between learning styles and performance with a p-value of  $p \leq 0.042$  in Table 4.33. This was followed by auditory language with a p-value of  $p \leq 0.034$  in Table 4.36, the last was expressiveness oral with a p-value of  $p \leq 0.044$  in Table 4.45. These were the sub-factors of age in the socio-demographic relationship. Kolb's theory of learning styles became applicable in the note taking process as it was used as the framework of the study. The theory is inclusive of time management and written expression (Kolb, 2005). Social individual, auditory language and oral expression have an overarching influence on academic performance and were also applicable in the study. A learner cannot express him/herself without understanding the subject matter; hence these items had a positive significant relationship with academic performance. The hypothesis cannot be conclusively rejected or accepted because of some uncontrolled extraneous variables that can impact on the results. There can also be some underlying assumptions or effects that may have prevented accurate testing of the hypothesis (Polit, 2012).

### **5.2.3 Results on the Relationship between Study Habits and Academic Performance**


The third hypothesis or objective tested the significant relationship between learning styles and academic performance in Mathematical Literacy. The results on the ordinary least square regression for a relationship between study habits in gender on performance in Mathematical Literacy showed no significant relationship with time management. When

testing for study environment, the p-value was  $p \leq 0.046$  in Table 4.9 and showed a significant relationship between gender and academic performance. The *writing* skills were also significant with a p-value of  $p \leq 0.033$  in Table 4.20 in the socio-demographic factor in the male category. Test taking, note taking, reading and Mathematical Literacy skills were not significantly associated with performance in the study habits.

#### **5.2.4 Results on the Relationship between Learning Styles and Academic Performance**

The fourth hypothesis had no significant relationship in academic performance between gender and learning styles. In some factors, there was a relationship between learning styles and academic performance. The hypothesis is therefore accepted because the results on the analysis confirm that there is no significant relationship.

#### **5.2.5 Results on the Relationship between Geographic Locations of Schools and Academic Performance in Mathematical Literacy of Grade 11 Students.**

The results on the fifth hypothesis indicated a significant relationship between locality of a school and academic performance.  In study habits, the relationship between geographic location of school was significant in the study environment, with academic achievement at a p-value of  $p \leq 0.014$ . Note taking was also significant with a p-value of  $p \leq 0.000$  while reading skills had a significant relationship with performance with a p-value of  $p \leq 0.005$ . Time management, test taking/preparation, writing skills and Mathematical Literacy were not significantly related to performance in geographic location.

In the learning styles, the results were collectively non-significant in geographic location of school with academic achievement. The hypothesis is accepted because of the non-significance of the relationship between locality and performance. Mathematical Literacy was introduced in South Africa as a subject that would assist learners in getting a better understanding of mathematical content and also improve the academic performance. Learners were, therefore, expected to perform better since mathematics is replaced with Mathematical Literacy. It may be regarded as a subject for intervention in academic performance. The results of the study analysis are different from the expectation of better

academic performance. This was also informed by the results on the analysis of the data collected to this regard.

### **5.3 Implications on Education, Research and Policy**

#### **5.3.1 Education (Educators and Practitioners)**

The study investigated the impact of study habits which included, among other items, time management and note taking. Time management and note taking are some of the components of study habits. They affect performance in mathematics or Mathematical Literacy since these subjects require a lot of practice and understanding. Time management is an important element in the planning and regulating study times. The study showed that the level of mathematics and Mathematical Literacy had a significant effect on time management. This shows that study habits are one the important variables in academic performance. It is not the amount of time that the learner spends on studying but the quality of time. On note taking, learners scored high and low on academic performance in Figure 16. Note taking involves accuracy and being fast in getting information and summarizing properly. This is used as a point of reference by the learner when studying and doing revision. If the notes are not accurate and have lots of mistakes, the learner ends up with incorrect information, and the result is failure.

It may happen that if there is a mistake on notes made by the teacher, all the students will take down that mistake without questioning the correctness of the statement. In some instances, teachers use phrases instead of a full sentence, and the learner is supposed to connect the dots. On the other hand, learners are expected to take down their own notes as the teacher is busy teaching. The learner is expected to keep up with the lesson and at the same time write notes. This requires a skill and at the end of the lesson or day, the learner is supposed to review the notes and look for mistakes. This means that the learner has to conceptualize the lesson and assimilate it. According to Siah and Maiyo (2015) study habits enhance quality in education and career actualization, and students who have good study habits excel than those who have no study habits. According to the study analysis results, learners have shown that there is a missing link between the

learner and the educator in that learners who scored high on note taking and time management were low on performance. This is an indication that the learners were not able to plan and manage their time properly. Learners can have plenty of time, but the quality of notes taken and the understanding of the material to be learned is difficult for them or maybe some are slow learners.

It is the prerogative of the educator to investigate whether the learners were able to understand the lesson. Some short true or false quizzes before the beginning of the main lesson are to be conducted. It may be a test of about five to ten questions on the major or main theme of subject, depending on the previous lesson. It is easy to mark and record such a short quiz and learners are always happy to get their results back as early as possible. The suggestion can be adapted to the subject that is being taught because not all the subjects can be taught the same way. According to some researchers, all students are capable of learning and the educators can teach all of them. The reason that not all students cannot be taught at the same time is that the educators are unable identify the different ways some students learn. In most instances, educators follow the orthodox way of teaching, which is lecturing even though some learners are not good at listening. It must be recognized that students come from different environments which have an impact on their attitudes and behavior.

### **5.3.2 Research**

The approach of the study was quantitative in its nature, which was deemed necessary so that it can be objective. To promote objectivity of the study, a questionnaire was used for data collection. The design of the study was descriptive correlational so as to identify if there was correlation or relationship between study habits and learning styles with academic performance in Mathematical Literacy. The study looked at the time management; study environment; preparation skills; note taking; written expression, etc. There was no significant linear association in study habits and learning styles with performance. Gender, location and level in Mathematical Literacy had significant effects. A qualitative approach on these variables should be done in order to obtain a deeper understanding of the concepts of study habits and learning styles whether there is correlation with academic performance. Qualitative approach is considered to have more

in-depth approach in research even though it has its own deficiencies. If, therefore, a mixed approach can be utilized, this may have better results to complement each other.

### 5.3.3 Policy

The education system is usually affected by policies that are passed by the government in order to address problems in the education system. The major problem that most governments are faced with is the academic performance of its learners. Meaningful changes are made to circumspect these problems. It is the same situation with the South African education system that introduced Mathematical Literacy to address the problem of poor academic performance. The introduction of Mathematical Literacy in 2006 presented a hope that poor academic performance was addressed. Table 3 reflecting comparison of pass rate in 2007 to 2008 showed that the pass rate went down by 2% (in 2007, it was 66.9% and in 2008, it was 64.5%) (Dept. of Education, 2008). Although the difference is not that big, it shows that there was a down turn in the results. Although the Department of Basic Education lowered the pass rate of students to 30% for National Senior Certificate in 2008 (Education 2008:25). This, together with introduction of Mathematical Literacy has not improved the overall performance of Grade 12 students in the country. The performance of Grade 11 students in Mathematical Literacy in the current study was very poor, with a mean of 25% and a range of 3%- 68% in Figure 4.3. Only 5% students obtained marks above 50%. The poor performance in Mathematical Literacy is consistent with poor academic student performance in South Africa.

According to the study results, gender, location and Mathematics and Mathematical Literacy had significant effects on performance. In other words, there was no improvement in the pass rate although Mathematical Literacy was introduced. This means that the education system needs to review the changes and consider some of the variables that affect the pass rate. There needs to be an introduction of community service among students who have graduated to encourage the culture of learning, especially in the rural areas. Most learners in the rural areas have parents who are illiterate and unable to help them with homework. Therefore, a community service program, if it is not already in place, would help to fill that gap.

## 5.4 Conclusion

The purpose of the study was to investigate if there was a correlation between study habits and learning styles in performance on Mathematical Literacy. Mathematical Literacy was introduced to the education system as a means of curbing poor academic performance among high school students. Eastern Cape Grade eleven (11) learners in the Amatole Education District were investigated to see if study habits and learning styles had any relationship with Mathematical Literacy. The outcome was that gender, school location, that is, urban or rural areas, and Mathematical Literacy level had significant effects on students.

Study habits were affected by school location because time management, preparation skills and reading skills had a significant effect on learners. In learning styles, there was a significant effect in social group, especially females, auditory language and written expression.

Note taking, auditory language, written expression and time management are an indication that students can either not express themselves properly or do not understand the language used in the medium of instruction. Note taking involves:

- a. understanding of the language in which the notes are written;
- b. the ability decipher, summarize or put in own words the information that is being read or lectured on;
- c. agility to write and listen at the same time to the lecture; and
- d. good listening ability.

The above points are inclusive of auditory language and written expression. Time management is of vital importance because the learner depends on the time used in studying. Most learners are not efficient in the use of time as there is a problem of procrastination.

The conclusion that can be drawn from the study is that study habits and learning style could determine students' academic performance in mathematical literacy. This is because they involve change of character, attitude and thought processing of an individual. Learning is not only based on academic achievement and performance but

also on career and character development. Study habits and learning styles, as these were the focus of this investigation, involves acquiring knowledge that is modified to address the requirements of daily life. It provides skills and strategies, especially time management, written expression, note taking and other variables mentioned in the study. The study revealed that students can be good in note taking and not successful in the final examinations because of some underlying problems that had been missed.

Time management is very important because it is the life line of any enterprise or entity that is involved in daily activities. Using time creatively and effectively provides success and good academic achievement and performance. Although the linear association in academic performance with study habits and learning styles was not straight, study habits and learning styles do have a correlation academic performance. In the analysis of the results it was the correlation that did not have significant effect, but the associated variables of gender, location and level of mathematics did have a significant effect. It is also suggested that study habits can be investigated separately from learning styles even though they somehow have an overlap. In the analysis of the variables that were investigated in the study, that is, study habits and learning styles, other variables were related to academic performance. Previous studies that have been conducted on learning styles and their correlation to academic performance concluded the same aspect of the importance of identifying learning styles for learners (Coffield, et al., 2004; Abidin, et al., 2011).

### **5.5 Limitations of the study**

The findings on the study shed light on the challenges that both educators and learners go through during the process of teaching and learning. This also highlighted the close relationship between the study habits and learning styles to the academic performance. It cannot be conclusively decided that there is a correlation between study habits and learning styles with academic performance. There were also some underlying factors that caused some limitations which were not part of the study though their presence affected the findings. Some of the limitations are highlighted in the following discussions. The financial constraints limited the study to only the Eastern Cape region. The study used a quantitative approach which does not have open-ended questions. If a participant was



interested to explain further the questionnaire did not accommodate that because of the nature of the approach.

Using a mixed method approach would have yielded better results as the qualitative approach would yield in-depth data results because of the probing questions used by the interviewer. A qualitative approach would complement the quantitative approach for further information. Most of the urban high schools do not offer Mathematical Literacy as a subject in the Amatole Education District in the Eastern Region, and this led them not to be involved in the study.

The irregular school attendance or absenteeism among learners was also a challenge. The limited understanding of the English language by both the educators and learners as it is a second language to most of participants and also a medium of instruction was an impediment. This situation occurs in most of the rural areas and urban in the townships.

## **5.6 Recommendations**

Since study habits and learning styles do not have a linear association with academic performance in the scatterplot, other variables such as time management, note taking and the rest have a significant effect on study habits and learning styles. It is recommended that schools integrate subjects that provide study habits. Educators should assist learners by encouraging them to develop more effective study habits and learning styles by first identifying the learning styles of the students. The study established that learners can study hard but at the end of the day, the results are poor. This is an indication that there are other underlying factors that have to be identified in the process of teaching the learners.

What are the causes of these miscalculations that let the learners down after reporting that they studied very hard?

One observation is that learners can have a good note taking ability, but the academic performance is poor as it is evident in Figure 16. Reading, writing skills and written expression are also shown in the scatter plots (Figure 17 Reading Skills; Figure 18 for Writing Skills and Figure 28 Written Expression).

Educators are to take a few moments to review the accuracy and correctness of notes that have been taken down by the learners, especially at the lower level classes. This can help the learners to correct mistakes and improve their ability of note taking, especially when they reach the higher education level.

At times, teachers write notes on the board using phrases or incomplete sentences. Learners may take down the notes without the understanding what the subject is all about. Some learners may also fail to write notes because of the following reasons:

- (a) The teacher is in a hurry to finish the syllabus, that is, writing very fast and immediately erasing the information;
- (b) Some learners do not have good eyesight and fail to see what is written on the board but are afraid of the teacher or peers because he/she does not want to look stupid;
- (c) Some learners may have a learning problem (Learning Disorder) which has not been identified by the teacher and are afraid of being laughed at by others;
- (d) Mathematic Literacy (and another subject) is taught in English at Grade 11. This could be one of the contributing factors to poor academic performance. Teachers should assist learners to master the English Language so that they can read with understanding

The abovementioned ideas can be picked up when learners are being interviewed for admissions at a learning institution. Only a few numbers of institutions of learning do have these interviews, especially at the lower levels. Unfortunately, some parents are not supportive of this because they think that their children are being discriminated against.

If a learner is misdiagnosed at a lower level, that person may not progress to higher levels of learning. Some learners end up developing some coping skills and mechanisms which help them to cope, despite adverse conditions. Other students become aggressive, and it becomes very difficult for teachers to deal with them. There are also learners who come from dysfunctional family backgrounds and children from poverty stricken areas and are not well developed mentally due to lack of nutritive meals (Schunk, 2012).

Educators need to understand the human development of the brain and the different stages that a human goes through. The presence of a psychologist at the lower levels of

education, because these are institutions that provide the basics of education, is essential. Most institutions of higher learning have this facility, but the lower ones are the ones that need them most. It would be beneficial if the education system can provide more budget for such services, especially in the rural areas where the services are mostly needed as some parents have minimal education and in some cases, are illiterate.

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**APPENDIX A: INSTRUMENT FOR DATA COLLECTION**

**STUDY HABITS AND LEARNING STYLES AS CORRELATES OF GRADE 11  
STUDENTS' ACADEMIC PERFORMANCE IN MATHEMATICAL LITERACY**

**IDENTIFICATION CODE:** .....

**SITE:**  
.....

**DATE:**  
.....

**INSTRUCTIONS:** The attached questionnaire forms are part of the research project that is being conducted at your school. There is no wrong or right answer. Please answer ALL the questions as honestly as possible. Place a mark (X) on each box appropriate to your answer. Your Identification Code is derived as follows: Year on which you were born; month and day e.g. (Year – 2000; Month - December; Day – 17) ID Code will be - 001217

The questionnaire is divided into THREE sections – Sections 1, 2 and 3.



**BIOGRAPHIC DATA**

1. Age: ..... Gender: ..... Race:  
..... Grade: .....

2. Locality of the school: a. Urban ..... b. Rural:  
.....

3. Student: a. Boarder ..... b. Day Scholar  
.....

4. Do you take a. Mathematics ..... b. Mathematical Literacy  
.....





1. Are you comfortable with your command of English grammar, punctuation, and spelling?
2. Do you have a clear idea of what the instructor requires for a writing assignment?
3. Do you make an outline of your paper, starting with the topic and outlining how the subsequent paragraphs will support your topic?
4. If you are assigned a research paper, do you know how to use the library or Internet to research your topic?
5. Do you start your research in time to complete it and write your paper without pulling an all-nighter just before the paper is due?
6. Are you able to communicate effectively in writing?

**TOTAL**


**Maths or Mathematical Literacy Skills**

1. Do you have a good command of the prerequisite skills for the math class in which you are enrolled?
2. Do you always do your homework assignments and work the problems before looking at the solutions?
3. Do you participate in class and ask questions when you do not understand a concept or formula?
4. Do you, at most, miss only two math classes per semester?
5. Can you explain to another student how to solve all the problems on a math test?
6. Do you have enough time after taking your tests to review for calculation errors and “stupid” mistakes like misplaced + or – signs?

**TOTAL**

1	2	3	4

### SECTION 3

(Answer each of these questions by marking with an X on the box below your chosen response)

#### Visual Language

1. Having assignment directions written on the board makes them easier to understand.
2. I would rather read a story than listen to it read to me.
3. I like written directions better than spoken ones.
4. I would rather read things in a book than have the teacher tell me about them.
5. I remember the spelling of a word better if I see it written down than if someone spells it out loud.

**TOTAL**



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#### Visual-Numerical

6. I understand a math problem that is written down better than one I hear.
7. Written math problems are easier for me to do than oral ones.
8. Seeing a number makes more sense to me than hearing a number.
9. Seeing the price of something written down is easier for me to understand than having someone tell me the price.
10. When the teacher says a number, I really do not understand it until I see it written down.

**TOTAL**  
**L**

	<b>RARELY</b>	<b>SOMETIMES</b>	<b>GENERALLY</b>	<b>ALWAYS</b>
	1	2	3	4
1. Having assignment directions written on the board makes them easier to understand.				
2. I would rather read a story than listen to it read to me.				
3. I like written directions better than spoken ones.				
4. I would rather read things in a book than have the teacher tell me about them.				
5. I remember the spelling of a word better if I see it written down than if someone spells it out loud.				
<b>TOTAL</b>				
	1	2	3	4
6. I understand a math problem that is written down better than one I hear.				
7. Written math problems are easier for me to do than oral ones.				
8. Seeing a number makes more sense to me than hearing a number.				
9. Seeing the price of something written down is easier for me to understand than having someone tell me the price.				
10. When the teacher says a number, I really do not understand it until I see it written down.				
<b>TOTAL</b>				
<b>L</b>				
	1	2	3	4



**Auditory-Visual-Kinesthetic**

- 31. It makes it easier when I say the numbers of a problem to myself as I work it out.
- 32. Writing a spelling word several times helps me remember it better.
- 33. I like to do things like simple repairs or crafts with my hands.
- 34. I like to make things with my hands.
- 35. I understand what I have learned better when I am involved in making something for the subject.

**TOTAL**  
**L**

**Expressiveness-Oral**

- 36. It is harder for me to do a written assignment than an oral one.
- 37. I feel like I speak smarter than I write.
- 38. If homework were oral, I would do it all.
- 39. Speaking is a better way than writing if you want someone to understand it better.
- 40. Spelling and grammar rules make it hard for me to say what I want to in writing.

**TOTAL**  
**L**

**Expressiveness-Written**

- 41. Written assignments are easy for me.
- 42. I do not mind doing written assignments.
- 43. The things I write on paper sound better than when I say them.
- 44. I like tests that call for sentence completion or written answers.
- 45. Sometimes I say dumb things, but writing gives me time to correct myself.

**TOTAL**  
**L**



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1	2	3	4
1	2	3	4
1	2	3	4



## APPENDIX B: Ethical Clearance Certificate



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### ETHICAL CLEARANCE CERTIFICATE REC-270710-028-RA Level 01

Certificate Reference Number: ADU171SYAK01

Project title: **Study Habits and Learning Styles as correlates of Grade 11 Students' Academic Performance in Mathematical Literacy in the Amathole Education District.**

Nature of Project: PhD in Education

Principal Researcher: Mzwandile John-Mott Yako

Supervisor: Prof E.O Adu

Co-supervisor: N/A

On behalf of the University of Fort Hare's Research Ethics Committee (UREC) I hereby give ethical approval in respect of the undertakings contained in the above-mentioned project and research instrument(s). Should any other instruments be used, these require separate authorization. The Researcher may therefore commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the UREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

The Principal Researcher must report to the UREC in the prescribed format, where applicable, annually, and at the end of the project, in respect of ethical compliance.

**Special conditions:** Research that includes children as per the official regulations of the act must take the following into account:


Note: The UREC is aware of the provisions of s71 of the National Health Act 61 of 2003 and that matters pertaining to obtaining the Minister's consent are under discussion and remain unresolved. Nonetheless, as was decided at a meeting between the National Health Research Ethics Committee and stakeholders on 6 June 2013, university ethics committees may continue to grant ethical clearance for research involving children without the Minister's consent, provided that the prescripts of the previous rules have been met. This certificate is granted in terms of this agreement.

The UREC retains the right to

- Withdraw or amend this Ethical Clearance Certificate if
  - Any unethical principal or practices are revealed or suspected
  - Relevant information has been withheld or misrepresented
  - Regulatory changes of whatsoever nature so require
  - The conditions contained in the Certificate have not been adhered to
- Request access to any information or data at any time during the course or after completion of the project.
- In addition to the need to comply with the highest level of ethical conduct principle investigators must report back annually as an evaluation and monitoring mechanism on the progress being made by the research. Such a report must be sent to the Dean of Research's office

The Ethics Committee wished you well in your research.

Yours sincerely

  
**Professor Wilson Akpan**  
**Acting Dean of Research**

02 February 2017

**APPENDIX C**  
**INFORMED CONSENT**

I hereby agree to participate in research regarding ..... I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop this interview at any point should I not want to continue and that this decision will not in any way affect me negatively.

I understand that this is a research project whose purpose is not necessarily to benefit me personally.

I have received the telephone number of a person to contact should I need to speak about any issues which may arise in this interview.

I understand that this consent form will not be linked to the questionnaire, and that my answers will remain confidential.

I understand that if at all possible, feedback will be given to my community on the results of the completed research.

.....  
**Signature of participant**



I hereby agree to the tape recording of my participation in the study.

.....  
**Signature of participant**

**Date:**

## APPENDIX D: Permission letter from the Department



STRATEGIC PLANNING POLICY RESEARCH AND SECRETARIAT SERVICES  
Steve Vukile Tshwete Complex • Zone 6 • Zwelitsha • Eastern Cape  
Private Bag X0032 • Bhisho • 5605 • REPUBLIC OF SOUTH AFRICA  
Tel: +27 (0)40 608 4773/4035/4537 • Fax: +27 (0)40 608 4574 • Website: [www.ecdoe.gov.za](http://www.ecdoe.gov.za)  
Enquiries: B Pamla      Email: [bbalwa.pamla@ecdoe.gov.za](mailto:bbalwa.pamla@ecdoe.gov.za)      Date: 08 May 2017

Mr. Mzwandile John-Mott Yako  
26 Acacia Road  
Beacon Bay  
East London  
5201

Dear Mr. Yako

**PERMISSION TO UNDERTAKE A DOCTORAL THESIS: STUDY HABITS AND LEARNING STYLES AS CORRELATES OF GRADE 11 STUDENTS' ACADEMIC PERFORMANCE IN MATHEMATICAL LITERACY IN BUFFALO CITY AND AMATHOLE EAST EDUCATION DISTRICTS**

1. Thank you for your application to conduct research.
2. Your application to conduct the above mentioned research in sixteen selected Secondary schools under the jurisdiction of Buffalo City and Amathole East Education Districts of the Eastern Cape Department of Education (ECDoE) is hereby approved based on the following conditions:
  - a. there will be no financial implications for the Department;
  - b. institutions and respondents must not be identifiable in any way from the results of the investigation;
  - c. you present a copy of the written approval letter of the Eastern Cape Department of Education (ECDoE) to the Cluster and District Directors before any research is undertaken at any institutions within that particular district;
  - d. you will make all the arrangements concerning your research;
  - e. the research may not be conducted during official contact time;



- f. should you wish to extend the period of research after approval has been granted, an application to do this must be directed to Chief Director: Strategic Management Monitoring and Evaluation;
  - g. your research will be limited to those institutions for which approval has been granted, should changes be effected written permission must be obtained from the Chief Director: Strategic Management Monitoring and Evaluation;
  - h. you present the Department with a copy of your final paper/report/dissertation/thesis free of charge in hard copy and electronic format. This must be accompanied by a separate synopsis (maximum 2 – 3 typed pages) of the most important findings and recommendations if it does not already contain a synopsis.
  - i. you present the findings to the Research Committee and/or Senior Management of the Department when and/or where necessary.
  - j. you are requested to provide the above to the Chief Director: Strategic Management Monitoring and Evaluation upon completion of your research.
  - k. you comply with all the requirements as completed in the Terms and Conditions to conduct Research in the ECDoE document duly completed by you.
  - l. you comply with your ethical undertaking (commitment form).
  - m. You submit on a six monthly basis, from the date of permission of the research, concise reports to the Chief Director: Strategic Management Monitoring and Evaluation
3. The Department reserves a right to withdraw the permission should there not be compliance to the approval letter and contract signed in the Terms and Conditions to conduct Research in the ECDoE.
  4. The Department will publish the completed Research on its website.
  5. The Department wishes you well in your undertaking. You can contact the Director, Ms. NY Kanjana on the numbers indicated in the letterhead or email [babalwa.pamla@ecdoe.gov.za](mailto:babalwa.pamla@ecdoe.gov.za) should you need any assistance.



**NY KANJANA**  
**DIRECTOR: STRATEGIC PLANNING POLICY RESEARCH & SECRETARIAT SERVICES**  
**FOR SUPERINTENDENT-GENERAL: EDUCATION**



## APPENDIX E: Ethics Research Confidentiality and Informed Consent Form



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### Ethics Research Confidentiality and Informed Consent Form

The University of Fort Hare together with the Department of Education is conducting research regarding: **Study Habits and Learning Styles as correlates of Grade 11 students' academic performance in Mathematical Literacy in the Amathole Education District.** We are interested in finding out more about the academic performance of learners in this province since it has been rated several times as one of the lowest academic achievement performers throughout the country.



University of Fort Hare

Please understand that you are not being forced to take part in this study and the choice whether to participate or not is yours alone. However, we would really appreciate it if you do share your thoughts with us. If you choose not to take part in answering these questions in the questionnaire, you will not be affected in any way. If you agree to participate, you may stop me at any time and tell us that you don't want to go on with the interview. If you do this there will also be no penalties and you will NOT be prejudiced in ANY way. Confidentiality will be observed professionally.

Your name will not be recorded anywhere on the questionnaire and no one will be able to link you to the answers you give. Only the researchers will have access to the unlinked information. The information will remain confidential and there will be no "come-backs" from the answers you give.

The interview will last around (45) minutes. You will be filling in your responses to the questions asked in the questionnaire and I ask that you are as open and honest as possible in answering these questions. Some questions may be of a personal and/or sensitive nature. You will be responding to some questions that you may not have thought about before, and which also involve thinking about the past, present or future. We know

that you cannot be absolutely certain about the answers to these questions but we ask that you try to think about these questions. When it comes to answering questions circle or mark your best response to the questions and there are no right and wrong answers.

If possible, your responses will help to influence decision making in the education system of the country and provide policy makers with a reference to look at.

## INFORMED CONSENT

I hereby agree to participate in research regarding: **Study Habits and Learning Styles as correlates of Grade 11 students' academic performance in Mathematical Literacy in the Amathole Education District..** I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop this interview at any point should I not want to continue and that this decision will not in any way affect me negatively.

I understand that this is a research project whose purpose is not necessarily to benefit me personally.



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I have received the telephone number of a person to contact should I need to speak about any issues which may arise in this interview.

I understand that this consent form will not be linked to the questionnaire, and that my answers will remain confidential.

I understand that if at all possible, feedback will be given to my community on the results of the completed research.

.....

**Signature of participant**

.....

**Date...**

**APPENDIX F: PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM FOR  
USE BY PARENTS/LEGAL GUARDIANS**



**University of Fort Hare**  
*Together in Excellence*

**PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM FOR USE BY  
PARENTS/LEGAL GUARDIANS**



University of Fort Hare  
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**TITLE OF THE RESEARCH PROJECT:**

**Study Habits and Learning Styles as correlates of Grade 11 students' academic performance in Mathematical Literacy in the Amathole Education District.**

**REFERENCE NUMBER:**

**PRINCIPAL INVESTIGATOR: Mzwandile John-Mott Yako**

**ADDRESS: 26 Acacia Road, Beacon Bay,  
East London - 5241**

**CONTACT NUMBER: 082 214 8793**



Your child is being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how your child could be involved. Also, your child's participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you or your child negatively in any way whatsoever. You are also free to withdraw him/her from the study at any point, even if you do initially agree to let him/her take part.

**This study has been approved by the University Research Ethics Committee at the University of Fort Hare and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.**

#### What is this research study all about?

- *The aim of the study is to get information about how the learners study and learn. The purpose is not to teach the learners but want to understand how they study what they learn. What and which is the most interesting way in which they learn and study better.*
- *The learners will first be told as to what is the study all about. Explain to them as to how the study is going to be conducted. Will be given a chance to contact parents and sign the consent form. Those who will participate will be told how to fill in the questionnaire.*
- *There will be no randomization because the study deals with the Grade 11 learners only no other learners will be affected.*
- *The study does not include any medications or treatment. It is only the response to the questionnaire.*



#### Why has your child been invited to participate?

- *Your child has been invited because: a. He/she is the best candidate for the study since the study deals with Grade 11 learners; b. because the study is based on learners who are actively involved in learning; c. your child is within the scope of the project, that is, the child belongs to the high schools that have been chosen and lastly d. need to be aware of their views as to how they learn because learning is a two way between learner and educator.*

### What will your responsibilities be?

- *My responsibility is to make sure your child's rights are respected, that is, no harassment to be experienced. If a child decides to leave the study halfway, that decision will be respected. Identity of the learner will be protected. Maintain a good relationship with the school administration, parents and learners.*

### Will your child benefit from taking part in this research?

- There are no immediate benefits for the learner in the study. The beneficiary will be for the principal investigator towards his studies. In the event of publishing the results of the study, the system of education may get some benefits towards improving the education system.

### Are there any risks involved in your child taking part in this research?

- There will be no risks involved in this study because all the activities will take place in the classrooms and school premises.

### If you do not agree to allow your child to take part, what alternatives does your child have?

- *Since the study is not involving treatment or medical procedures, there will be no need to have a concern about the health of your child.*



University of Fort Hare  
1928

### Who will have access to your child's medical records?

- *No child medical records will be involved. In accessing the information for reference on the study, it is always confidential. Identity of the participants will remain anonymous.*

### What will happen in the unlikely event of your child getting injured in any way, as a direct result of taking part in this research study?

- ***There is no likelihood that the child can get injured because the process of data collection takes place in a classroom situation with no different environment on a day to day classroom activity.***

**Will you or your child be paid to take part in this study and are there any costs involved? You or your child will not be paid to take part in the study, but out-of-pocket expenses will be covered for each study visit. There will be no costs involved for you if your child does take part.**

### Is there anything else that you should know or do?

- **You can contact the Chairperson of the University Research Ethics Committee if you have any concerns or complaints that have not been adequately addressed by your child's study doctor.**

- **You will receive a copy of this information and consent form for your own records.**

Assent: Children with an age of 7 and above must give assent to participate in research

Declaration by parent/legal guardian

By signing below, I (*name of parent/legal guardian*) .....  
 agree to allow my child (*name of child*) ..... who is .....  
 years old, to take part in a research study entitled: **Study Habits and Learning Styles as correlates of Grade 11 students' academic performance in Mathematical Literacy in the Amathole Education District.**

I declare that:



University of Fort Hare

- I have read or had read to me this information and consent form and that it is written in a language with which I am fluent and comfortable.
- If my child is older than 7 years, he/she must agree to take part in the study and his/her ASSENT must be recorded on this form.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurized to let my child take part.
- I may choose to withdraw my child from the study at any time and my child will not be penalized or prejudiced in any way.
- My child may be asked to leave the study before it has finished if the study doctor or researcher feels it is in my child's best interests, or if my child do not follow the study plan as agreed to.

Signed at (*place*) ..... on (*date*) .....

.....  
Signature of parent/legal guardian

.....  
Signature of witness

### Declaration by investigator

I (*name*) ..... declare that:

- I explained the information in this document to .....
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understand all aspects of the research, as discussed above
- I did/did not use an interpreter (*if an interpreter is used, then the interpreter must sign the declaration below*).



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Signed at (*place*) ..... On (*date*) .....

.....  
Signature of investigator

### Declaration by interpreter (Only complete if applicable)

I (*name*) ..... declare that:

- I assisted the investigator (*name*) ..... to explain the information in this document to (*name of parent/legal guardian*) ..... using the language medium of Afrikaans/Xhosa.

- We encouraged him/her to ask questions and took adequate time to answer them.
- I conveyed a factually correct version of what was related to me.
- I am satisfied that the parent/legal guardian fully understands the content of this informed consent document and has had all his/her questions satisfactorily answered.

Signed at (*place*) ..... On (*date*) .....

.....  
Signature of interpreter

.....  
Signature of witness



## APPENDIX G: Language Editing Certificate

23 Elfin Glen Road, Nahoon Valley Heights, East London, 5200

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### To whom it may concern:

This document certifies that the PhD thesis whose title appears below has been edited for proper English language, grammar, punctuation, spelling and overall style by Rose Masha, a member of the Professional Editors' Group whose qualifications are listed in the footer of this certificate.

### Title:

**STUDY HABITS AND LEARNING STYLES AS CORRELATES OF GRADE  
11 STUDENTS' ACADEMIC PERFORMANCE IN MATHEMATICAL  
LITERACY IN THE AMATHOLE EDUCATION DISTRICT**

### Author:

**MZWANDILE JOHN-MOTT YAKO**

### Date Edited:

**20 December 2018**

Signed

A handwritten signature in black ink, appearing to read "Rose Masha".

**Dr. Rose Masha**